THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 32 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, HEATING, MECHANICAL, CHEMICAL AND GENERAL SCIENCE.

VOLUME LXVIII.—No. 14 Whole No. 1,191. | NEW YORK, MONDAY, APRIL 4, 1898 | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager. THOMAS J. CUNNINGHAM and ELBERT P. CALLENDER, Editors.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y., AS SECOND-CLASS MATTER.

Published on each Monday of the year, at No. 32 Pine Street, New York.

Collections are invariably made directly from this office for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Terms of Subscription, Including Postage—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

Remittances should be made either by post office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C. O. D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
- Wrinkle Department, Pacific Coast Gas Association..... 529
- April Meeting, Guild of Gas Managers..... 529
- April Meeting, Society of Gas Lighting..... 529

EDITORIALS—
- Briefly Told..... 529
  - The Decision Over the Rawson Patents—"The Calorific Power of Fuels"—Notes.
- Proceedings Fourteenth Annual Meeting, Ohio Gas Light Association..... 530
  - First Day, Morning Session—Report of the Executive Committee—Election of New Members—Reports of Secretary and Treasurer—Roll Call—Letters of Regret and an Invitation—Committee on President's Address—Discussion on the Paper by Mr. E. G. Schmidt—Discussion on the Paper by Mr. J. H. Maxon—First Day, Afternoon Session—Report from Committee on Next Place of Meeting—Discussion on the Paper by Mr. Butterworth—Discussion on the Paper by Mr. Coombs—The Question Box.
- Calcium Carbide and Acetylene..... 541

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 542
- Mr. Hadden Takes Charge at Poughkeepsie—New Holder for the Lockport (N.Y.) Company—An Inquiry—Mr. Ross Goes to Westchester, N.Y.—Contract for the Riter-Conley Company—Board of Directors, Detroit (Mich.) Company—An Explosion of Acetylene—Franchise Extended, Houston, Texas—Annual Meeting, Laconia, N. H.—Sale of the Somerset (N. J.) Lighting Company—An Act to Punish Thefts of Gas or Electric Currents—An Electrolysis Ordinance, Atlanta, Ga.—Proposed Opposition for East St. Louis, Ills.—Presentation to Mr. John F. Walsh—Death of Mr. Truman B. Welch—Death of Mr. G. H. Reinoehl—And Other Items.

The Market for Gas Securities..... 544

[OFFICIAL NOTICE.]

Wrinkle Department, Pacific Coast Gas Association.

MERCED, CAL., March 11, 1898.

To the Members of the Pacific Coast Gas Association: At the last meeting of the Pacific Coast Gas Association to me was delegated the duty of collecting and presenting any matter, in the shape of original ideas or special devices, which may come under the head of "Wrinkles," to be presented in proper form for the benefit of the Association at the next regular assembly.

Many of our members having charge of gas plants on the Coast have many plans, that are practical, handy and labor-saving, which many others by force of circumstances have never seen, but who, on presentation of the device, drawn and described, or through the medium of our official organ (the AMERICAN GAS LIGHT JOURNAL), would gladly embrace the opportunity, and put into practice a plan very beneficial—which perhaps had been in use in some obscure place many years, used exclusively by one man—that would, when given daylight, benefit the whole gas fraternity.

On reading this communication, please see if you have not forgotten something in the shape of a "Wrinkle," that is doing good service in your works, that would be of great importance to the Association. Your answer to this will greatly oblige.

GEORGE H. HOLLIDGE,
Editor "Wrinkle" Department.

[OFFICIAL NOTICE.]

April Meeting, Guild of Gas Managers.

OFFICE OF THE SECRETARY, March 31, 1898.

The next regular meeting of the Guild of Gas Managers will be held in Young's Hotel, Boston, Mass., at noon of Saturday, April 9th.

A. K. QUINN, Secretary.

[OFFICIAL NOTICE.]

April Meeting, Society of Gas Lighting.

OFFICE OF THE SECRETARY, April 1, 1898.

The April meeting of the Society of Gas Lighting will be held in "The Arena," No. 39 West 31st street, New York city, at 3 P.M., of the 14th inst.

FRED. S. BENSON, Secretary.

BRIEFLY TOLD.

THE DECISION OVER THE RAWSON PATENTS.—On pages 540–41 of the current issue of the JOURNAL will be found the text of the decision, given by Judge Townsend, of the United States Circuit Court, Southern District of New York, in the case entitled the Welsbach Light Company vs. The Sunlight Incandescent Gas Lamp Company. Judge Townsend seems to have sustained the plaintiff's contentions so completely and thoroughly that little is left to comment upon, as far as the

validity and complete value of the Rawson's patents are concerned, other than to say that those engaged in the manufacture and sale of mantles for use in incandescent gas lighting, outside of the Welsbach Light Company, are not in good commercial standing. The decision is so broad, without being in any sense indefinite, that, even if an appeal from it is possible, such action would hardly be defensible on the ground of any likelihood of its success. Whether Judge Townsend's dictum is for the b st, so far as the regularly organized gas interests of the country are concerned, is a matter that time alone can separate; but, meanwhile and on the face of it, the Welsbach Light Company's standing has been greatly fortified.

"The Calorific Power of Fuels."—The name of Mr. Herman Poole, F.C.S., is not unknown to our readers, because of his interesting and useful contributions to our columns, which articles have never borne the taint that often accompanies matter prepared with a view to advocating any special device, apparatus or system, born of invention or substitution. Mr. Poole is a practical chemist, is a rational student and a quiet applier of that which his studies inform him, and in that knowledge it was with satisfaction we received the other day a copy of his work (from the press of John Wiley & Sons, New York), treating on "The Calorific Power of Fuels." The author admits that his treatise is founded on M. Scheurer-Kestner's "Pouvoir Calorifique des Combustibles;" but Mr. Poole has, with characteristic industry, so arranged his compilation that it is hard to tell where the one ends and the other begins, or vice versa. However, he has succeeded in putting together a book that will be well worth its price many times over to every gas man who wishes to keep in touch with the finer threads of his profession. The chapters on practical calorimetry are especially useful, in that therein are concisely described the plans and the ways and means of operating the main types of calorimeters in current use. The book is a credit to the author and to his publishers; for conjointly they have left nothing undone that should have been done in its preparation and printing.

Notes.—Mr. William H. Smith, who has made for himself a successful record in conjunction with the Superintendency of the Bayonne and Greenville (N. J.) Gas Light Company, has accepted a responsible position in connection with the United Gas Improvement Company's Philadelphia works.——The Hudson County (N. J.) Gas Light Company proposes to extend its mains to the outlying district known as Bull's Ferry.——We regret to report the death of Mr. Daniel Andrews, President of the Hamilton (O.) Gas Light and Coke Company, who passed over on the morning of Monday, March 28th. Deceased, who was in his 67th year, was well known and respected in Hamilton, in which thriving city he had many substantial business interests. A widow and four children survive him.——At the annual meeting of the Hamilton (Ont.) Gas Light Company the Directors voted to put the selling rate at $2 per 1,000 cubic feet, subject to a discount of 30 per cent. for prompt payment. The officers chosen were: Directors, F. W. Gates, John Proctor, Edward Martin, Wm. Hendrie, Wm. Gibson, F.W. Fearman and Henry McLaren; President, F. W. Gates; Vice-President, John Proctor.——Miss Collings is conducting this week, under the auspices of the Ottawa (Canada) Gas Company, a series of demonstration lectures on cooking by gas in Ottawa.——The electric light plant which supplies the city of Houston, Texas, was rendered practically useless, by an explosion in the boiler room, that occurred early in the evening of March 26th. Fire subsequently completed the destruction that the explosion initiated. The Houston Gas Light Company did excellent service in supplying, at the shortest notice, light to the shops and residences that depended for their illumination on the service of the electric company.——The opposition gas interests at Port Huron, Mich., were merged by consolidation on Monday last, through the negotiations that originated with Messrs. Isaac C. Baxter and James T. Lynn. The name of the succeeding corporation is "The Port Huron Gas Company," and its officers are: Directors, E. T. Lynch, Col. Jerome Croul, I. C. Baxter and J. T. Lynn, of Detroit; and Joseph Walker, A. D. Bennett and James Golden; President, Jas. T. Lynn; Vice-President, A. D. Bennett; Secretary and Treasurer, Isaac C. Baxter—all of whom have the appearance of health, from either a financial or engineering standpoint.——Justice White, sitting in Special Term of the New York Supreme Court, has decided that the authorities of Le Roy, N. Y., are not obligated to operate the Le Roy gas works, despite the fact that the properties were regularly condemned and valued by a board of examination and award appointed through and by specific legislation.——The net revenue for the year ended February 28, 1898, of the Montreal Gas Company, was $338,947.75.

PROCEEDINGS FOURTEENTH ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

Held at Cleveland, Ohio, March 16 and 17, 1898.

First Day, March 16—Morning Session.

The Ohio Gas Light Association convened in Fourteenth Annual Meeting, in Hotel Hollenden, Cleveland, Ohio, March 16, 1898, at 10 o'clock, A.M.

The President, Mr. W. C. Boyle, of Salem, Ohio, called the Association to order. On motion of Mr. Persons, the reading of the minutes of the last meeting was dispensed with.

Report of the Executive Committee.

Secretary Lathrop read the following report from the Executive Committee:

Cleveland, Ohio, March 16, 1898.

To the Members of the Ohio Gas Light Association: The Executive Committee makes the following recommendations:

First.—That Messrs. George W. McCook, E. H. Jenkins and Eugene Printz be appointed a Nominating Committee.

Second.—That Messrs. Wm. C. Hedges, John D. McIlhenny and A. D. Cressler be appointed a Committee on Memorials.

Third.—That Messrs. J. W. R. Cline, J. H. Maxon and W. W. Prichard be appointed a Committee on Next Place of Meeting.

Fourth.—That Messrs. C. W. Kauke, L. A. Strong, Wm. Blinks, S. Witham, E. M. Dundon, E. D. Sheets and Jas. M. Starr be released from membership, at their own request.

Fifth.—That Messrs. * * * (here are given the names of 12 members) be dropped from membership for non-payment of dues.

Sixth.—That Messrs. George Treadway Thompson, Ernest E. Eysenbach, J. A. Mayers, Jas. B. Fisher, George P. Steele, W. F. Douthirt, John Walters, C. W. Andrews, B. P. Foster, Geo. W. Barnes, Geo. B. Edgar, E. C. Critchlow, F. W. Stone, Frank H. Hess, Isaac C. Baxter, O. P. Moon, Frank D. Moses and John Read Miner be elected to active membership.

Geo. Whysall,
Dan'l. R. Warmington,
T. C. Jones,
} Executive Committee.

On motion of Mr. J. W. R. Cline, the report of the Executive Committee was adopted and ordered spread upon the minutes of the Association.

Election of New Members.

The Secretary, who was instructed to cast the ballot of the Association for the election to membership in the Association of the applicants recommended in the report of the Executive Committee, subsequently reported that he had complied with the instruction, and the applicants named were thereupon declared elected.

Reports of Secretary and Treasurer.

Secretary and Treasurer Lathrop here submitted the following annual reports:

Cleveland, Ohio, March 16, 1898.

To the Members of the Ohio Gas Light Association: I present here with my report, for the period between February 3, 1897, and March 16, 1898:

New members admitted at 13th annual meeting	8
Released from membership	9
Deaths	2
Active members, this date	171
Honorary members, this date	12
Badges on hand	2

Financial Report.

Receipts.

Balance from last year	$278.69
Received from dues	426.00
Received from initiation	40.00
Received for badges	15.00
Received from Gas Journals for report of 13th annual meeting	75.00
	$834.69

Expenditures.

Printing and stationery	$161.45
Postage	32.00
Expense of reporting 13th annual meeting	75.00
Secretary's salary, 13th annual meeting	300.00
Telegrams	7.08
Express	.45
Balance on hand, as per certified check	$258.71

Respectfully submitted,

A. P. LATHROP, Sec. and Treas.

Approved, GEO. WHYSALL, DAN'L. R. WARMINGTON, } Finance Committee.

The reports, on motion, having been received, accepted and ordered spread upon the minutes, the President ordered that the roll be called. The following answered:

ROLL CALL.

Honorary.

Coverdale, R. T., Cincinnati, O. Greenough, M. S., Cleveland, O.

Active.

Adams, C. F., Chicago, Ills.	Hyde, G. A., Cleveland, O.
Andrews, C. W.	Jenkins, E. H., Buffalo, N. Y.
Barnes, G. W.	Jones, T. C., Delaware, O.
Baxter, I. C., Detroit, Mich.	Kauke, J. H., Wooster, O.
Bonney, W. P., Erie, Pa.	Lathrop, A. P., Columbus, O.
Booth, M., Bellaire, O.	Lindsley, E., Cleveland, O.
Boyle, W. C., Salem, O.	Little, F. W., Akron, O.
Bredel, F., Milwaukee, Wis.	Lloyd, E. F., Fort Wayne, Ind.
Butterworth, I., Columbus, O.	Mayers, J. A., Columbus, O.
Callender, E. P., New York City.	McCall, H., Tiffin, O.
Cantine, W. W., Alliance, O.	McCook, G. W., Steubenville, O.
Christian, G. H., Norwalk, O.	McDonald, D., Louisville, Ky.
Clapp, G. N., Middletown, O.	McDonald, D., Albany, N. Y.
Clark, G. M., Chicago, Ills.	McIlhenny, J.D., Philadelphia, Pa.
Cline, J. W. R., Springfield, O.	McLain, C. M., Massillon, O.
Collins, D. J., Philadelphia, Pa.	Maxon, J. H., Gallipolis, O.
Connelly, J. S., Titusville, Pa.	Moon, O. P.
Coombs, M., Youngstown, O.	Moses, F. D.
Cressler, A. D., Fort Wayne, Ind.	Osius, G., Detroit, Mich.
Crisp, G. E., Elyria, O.	Persons, F. R., Toledo, O.
Critchlow, E. C.	Prichard, W. W., Portsmouth, O.
Dangler, D. E., Cleveland, O.	Printz, E., Zanesville, O.
Dawes, B. G., Newark, O.	Roots, D. T., Connersville, Ind.
Dell, J., St. Louis, Mo.	Russell, D. R., St. Louis, Mo.
Doherty, H. L., Madison, Wis.	Schmidt, E. G., Sandusky, O.
Eaton, A. B., Chicago, Ills.	Stacey, F. A., Chillicothe, O.
Edgar, G. B.	Steele, G. P.
Eysenbach, E. E., Columbus, O.	Stephens, J. G., Pittsburgh, Pa.
Faben, C. R., Jr., Toledo, O.	Stevenson, J. B., 3d, Van Wert, O.
Fisher, J. B.	Stone, F. W.
Foster, B. P.	Tayler, G. H., Warren, O.
Gassett, A. L., Cleveland, O.	Taylor, O. P., New Philadelphia, O.
Gribbel, W. S., New York City.	Templeton, E. S., Greenville, Pa.
Guldlin, O. N., Fort Wayne, Ind.	Thompson, G. T., New York City.
Gwynn, J. W., Bucyrus, O.	Warmington, D. R., Cleveland, O.
Gwynn, J., Steubenville, O.	Walters, J.
Harper, H. D., Chicago, Ills.	Warren, E. C., Cleveland, O.
Harris, J. A., Philadelphia, Pa.	Welch, C. H., Athens, O.
Hedges, W. C., Mansfield, O.	Wells, L. W., Canton, O.
Henderson, E. H., Pittsburgh, Pa.	Whysall, G., Dayton, O.
Hess, F. H., Ann Arbor, Mich.	Wilkiemeyer, H., Evansville, Ind.
Holmes, B. P., Youngstown, O.	Wones, W. R., Springfield, O.

LETTERS OF REGRET.

The Secretary—I have received letters from the following gentlemen expressing regret at their inability to be present at this meeting: Messrs. C. W. Blodget, A. C. Humphreys, F. Egner, John Corscot, Edmund Cathels, W. H. Pearson, J. P. Harbison, Wm. Eaton, W. A. Stedman, Walton Clark, Henry B. Leach, George G. Ramsdell, F. H. Shelton, Henry W. Douglas and James W. Dunbar. Mr. Dunbar says:

Please extend to the members of the Ohio Gas Light Association a cordial invitation to be present at the Twenty-first annual meeting of the Western Gas Light Association, to be held at Detroit, Michigan, May 18th to 20th. Wishing you again a pleasant and profitable meeting, I remain, Yours very truly,

JAMES W. DUNBAR, Secy. Western Gas Association.

President Boyle then read the

INAUGURAL ADDRESS.

[For President Boyle's Address, see JOURNAL, March 28, p. 490.]

On motion, the President's Address was received and referred to a committee (Messrs. G. H. Tayler, F. R. Persons, and G. H. Christian) to consider and report upon the recommendations therein contained.

The President introduced Mr. E. G. Schmidt, Superintendent of the Sandusky (O.) Gas and Electric Company, who read a paper on

HOW TO AVOID COMPETITION IN A SMALL TOWN.

[For Mr. Schmidt's paper, see JOURNAL, March 28, p. 491.]

Discussion.

The President—We have listened to a very valuable paper, gentlemen, and one full of good advice. As the situation of the Sandusky Company is the situation of quite a number of companies in the Association, we would be glad to hear an extended discussion upon this subject. I will ask Mr. Cline to speak to us on this topic.

Mr. Cline—One matter in Mr. Schmidt's paper to which I wish to call attention is with reference to competing companies. He says, "There is no room for competing companies in towns of less than 30,000 population, even though they practice the strictest economies. When such conditions exist, I would suggest that the companies bury the hatchet and combine forces." I would like to ask, what is his plan of combining forces?

Mr. Schmidt—Consolidation.

Mr. Cline—How?

Mr. Schmidt—I presume Mr. Cline refers chiefly to competition between gas and electric companies. I presume where two gas companies were competing in the same city you probably could not gain very much by efforts to consolidate; still, consolidation reduces expense considerably. In Sandusky we have it all our own way. There is no competing plant. We furnish power to the street railway; and in fact we are the only source from which power and light can be obtained in the city. We have always endeavored to give a fair service at reasonable rates.

Mr. Cline—How large a city is Sandusky?

Mr. Schmidt—The census of 1890 showed a little over 18,000; we have probably 20,000 now.

Mr. G. H. Christian—I would like to ask whether it requires a two-thirds vote, or only a majority vote, in a case where there is an ordinance of a City Council to extend a franchise where there is already a franchise for a limited purpose? For instance, a fuel gas company having a franchise for furnishing gas for fuel purposes, wants the franchise extended to the furnishing of gas for illuminating purposes. It goes upon the theory that after the gas passes the meter it does not make any difference what the consumer does with it. That is the way they are trying to get into Norwalk. If they want to use it for illuminating purposes, our rights are infringed upon and we object to it.

Mr. Boyle—If they do that, I should think they make themselves liable for damages.

Mr. Christian—They probably do, but I am afraid they would do it if the opportunity presented itself. We have a case in our town where a company have been supplying fuel gas for 80 cents per 1,000 for about a year. This spring they appeared before our City Council and asked permission to have a vote submitted to give them the franchise to furnish illuminating gas also. They found they were getting themselves into trouble by furnishing gas for illuminating purposes without the proper franchise. I would like to ask if any member here knows what the law is in regard to the vote to be taken on such a proposition; whether it requires a majority or a two-thirds vote? The law states, I think, that there must be a vote by the people before the second company can be authorized to furnish illuminating gas, but I am not prepared to say, and therefore make the inquiry, whether the law requires simply a majority vote, or whether it requires a two-thirds vote, as in the case of a bond issue. In the latter case, of course, a two-thirds vote is necessary.

Mr. Holmes, being called on by the Chair, said—It seems the author of this paper has covered the ground so thoroughly that he has left no room for discussion. I know that a number of points he raises have come up in my own experience, but I do not know that I can enlarge upon them now to any profit to the Association. I agree with him perfectly in his treatment of municipal officers and consumers as well. I call to mind an incident (in fact, I was talking about it with one of our people yesterday) of perhaps a year or so ago, when a man in our employ left us under circumstances which were not very creditable to himself, and became one of our most aggressive enemies—this was in con-

nection with gas and electric light competition. We had done a great deal for him in pushing him forward and developing him in the business, and after he began to be of material service to us he went over to the opposition company. We were legally helpless to do anything. We, therefore, concluded to say nothing. The result is, he is back with us to-day, and I don't believe anybody could induce him to leave us again. I think if I had expressed my opinion of what he had done he would have remained with the other company.

Mr. Persons—Mr. President, can't you answer Mr. Christian's question as to the law on that subject? You ought to be able to do it as well as anybody else.

The President—He is right in reference to his statement of the law, but the very thing that he is in doubt about I am also in doubt about. I think, however, it would require a two thirds vote of the people, but I would not like to express an opinion without opportunity for further investigation.

Mr. Persons—In Toledo, a few years ago, the question came up of a franchise for a new pipe line company, which required a two-thirds vote of all the votes cast to carry it. The vote on the question was very light. Only a very small percentage of the total general vote cast was voted on that question, and of course it was overwhelmingly defeated. While a large majority of the votes cast on the particular matter of the franchise were cast in its favor, yet there was lacking a two-thirds majority of all the votes cast.

Mr. J. B. Stevenson—In our town of Van Wert the electric light company has a contract with the city to furnish so many arcs of a nominal 2,000 candle power. The Council found much fault with the company and retained an expert from Chicago to examine the candle power of the light furnished, who reported that the candle power did not exceed 400. On the basis of his report the City Council declared the contract with the electric light company null and void. Do you think the position taken by the City Council can be sustained?

The President—What was the contract with the company?

Mr. Stevenson—That it should furnish a nominal 2,000 candle power light. The contract had seven years to run, but the Council declined to pay any bills since January last. The company, however, is still furnishing electric light. We have not entered suit for our money and the city has not entered suit against us as yet. If any member here has had experience along this line I would like to hear from him.

The President—That question involves an interpretation of the particular contract, and also of the word "nominal" as used in that connection.

Mr. Stevenson—The word "nominal" may let us out.

The President—I presume the decision of a court would be required to determine that question. I at least would not want to give an opinion upon the subject without a retainer. (Laughter.)

The Secretary—I would like to ask Mr. Stevenson how the test was made of those lights?

Mr. Stevenson—I do not know. The Council had this expert come to Van Wert and he made the test. I do not know what instrument he used, nor what took place with reference to the matter. He did not come to the electric light station at all.

The Secretary—You do not know then whether he made the test by means of a photometer?

Mr. Stevenson—I do not. The Council refused to make his report public in any way, and we have not been informed as to what has taken place in reference to the matter, as our relations with the Council are such that we have not been taken into their confidence.

Mr. George W. McCook—Can anyone tell us what a "nominal" 2,000-candle power light gives in actual candle power?

The President—Can any electric light man here answer that question? What is a nominal 2,000-candle power light?

Mr. E. S. Templeton—As I understand it a "nominal" 2,000-candle power light is 500 actual candle power. I think the rule is to multiply the actual candle power by four in order to ascertain the nominal candle power.

Mr. Schmidt—You probably have heard the story told by one of Brush's agents who, when trying to sell a 2,000 candle power light, was asked how he arrived at the estimate of 2,000 candle power, and said, "A lamp hanging at the intersection of two streets gives 500 candles to the north, 500 candles to the east, 500 candles to the south and 500 candles to the west; or, altogether, 2,000-candle power. So I think the statement of Mr. Templeton, according to the estimate of Brush's agent, is pretty nearly correct. It is a very difficult matter to measure the candle power capacity of an arc lamp by means of the photometer because of the dust and many other imperfections encountered that tend materially to vary the result.

Mr. McCook—I do not believe we understood fully what Mr. Templeton said as to the manner in which the "nominal" candle power is measured by the actual candle power.

Mr. Templeton—An arc light is not measured the same as a gas light or an incandescent electric light. The rule, as I understand it, is to multiply the actual candle power by four in order to ascertain the nominal candle power. In determining the candle power of an arc light at a street intersection, you have to measure four ways. As I understand the rule, in ascertaining the capacity of an arc light, if the photomoter shows 500 candle power, it is called 2,000 "nominal"; or where it measures 400 actual it would be called 1,600 "nominal."

The President—That is as near as you can get to 2,000?

Mr. Templeton—No; but nominal 2,000-candle power, as it is applied to the electric lighting business, does not mean actual 2,000; but the term is applied in the sense in which it is used in the electric lighting business.

Mr. Schmidt—I do not believe they ever attempt to measure it. They make a lamp and put 450 watts through it, and whatever light they get is called 2,000-candle power.

Mr. Cline—How did Mr. Schmidt explain to the satisfaction of his Council Committee that he was furnishing them 2,000-candle power lamps?

Mr. Schmidt—We simply explained that we were furnishing a standard lamp. I did not attempt to tell them that it was 2,000-candle power. I said I did not know whether it was 5,000, or 100, or what; but that we were putting the amount of power through the lamp that was required by the contract in furnishing a standard lamp; that we were using a good grade of carbon, and were able to satisfy them we were doing all we could to live up to the terms of our contract. That is all we could do. I could not tell them whether it was a 2,000 or a 200-candle power lamp. I would not try to do it, because I did not know it myself, nor did anybody else.

The Secretary—Did your contract call for a "nominal" 2,000 candle power lamp, or did it call for a 2,000-candle power lamp?

Mr. Schmidt—Our contract called for 2,000-candle power lamps.

The Secretary—And you got out of your troubles?

Mr. Schmidt—We got out of our troubles. We satisfied the Council committee, which was all that was necessary.

Mr. Jenkins—I would suggest to the gentleman who asked the question in regard to the 400-candle power lamp, that he should, if possible, make the expert show his hand and divulge how he arrived at the estimate of 400-candle power. In illustrating that matter I would say we had some expert investigations at Covington, Ky., last year. An expert was retained by the city authorities and a test was made. The question came up in regard to "meter lamps"—we had nine "meter" lamps to measure the consumption of our street lamps. We took the average of the nine meter lamps and charged up all of our lamps to the city on that averaged basis. The expert, who came from Cincinnati, went around the city for an hour or two, removing a burner, taking off its tip and looking at it, and, after a casual and cursory examination in this way, he undertook to make a report to the city officials as to the lighting capacity of our lamps. The result was we got into a whole lot of trouble in a very short time, but all we did was to try to make him prove his statements. In this way we were able to illustrate the foolish position he assumed in the premises, and it speedily became evident that he knew so little about the business that we did not have any further trouble as far as his investigation was concerned. These alleged experts, who make experiments for the inspection of the committee alone, have very little foundation for their claims, and if you make them show their hands you will very probably be able to illustrate to the committee that the investigation and result of the expert are not to be relied upon. At Covington we forced them to show their report and their hand, in which way we were able to illustrate that the report and figures upon which they were relying were not worth credence.

Mr. E. Witherby, Lockport, N. Y.—Although I am not a member of the Association I may be able to give you some information on the rule with reference to ascertaining the candle power of an electric lamp. Authorities like Prof. Houston and others give this rule: Adjust the lamp to take 48 volts, with a current strength of 9.6 amperes, and it will give you what is considered a nominal 2,000-candle power lamp. Take a pressure per lamp of 48 volts, and, with a current strength of 9.6 amperes, you have what is acknowledged by all experts to be a nominal 2,000-candle power lamp. It is impossible, by reason of the mechanism of an electric lamp, to make it always fit so that the arc is exactly the same distance apart in each instance. The longer the arc the higher the voltage, and each lamp on a constant current machine has an individual voltage which is accounted for by the adjustment of the

lamp in the clutches, and in the mechanism of the fittings and various other little irregularities, which will come and go, such as dirt, insects, etc., that will get in there and change the voltage on each particular lamp. If you change the voltage and find that you thereby change the candle power of your lamps throughout the circuit wherein your current is the same, you will find that it will affect all of your lamps practically alike. If your current regulator, whether it be a Brush or a T.-H. standard machine, or if your controller does not work properly, then all of your lamps will change in unison; but when you find that one lamp changes individually or independently of all other lamps, it is by reason of some slight irregularity in that particular lamp. A voltage of 48 with a current strength of 9.6 amperes is acknowledged by all experts to yield a nominal 2,000-candle power lamp, and it is so recognized by the electrical fraternity throughout the United States, and for that matter throughout the world, so far as I know. If you have agreed to furnish nominal 2,000 candle power lamps, if you keep the pressure, according to the chart sheets at your station, showing that your current is carried at an average of 9.6 amperes, figured on a basis of the number of lamps, multiplied by 48 volts for your entire pressure, you could prove to any committee that you are furnishing what is nominally called 2,000-candle power lamps, and you can collect your bills despite what the council or other city authorities might attempt to do.

Mr. Stevenson—About how much actual candle power is there in a nominal 2,000 candle power lamp?

Mr. Witherby—I believe, as far as the actual candle power in the individual lamp would be concerned, as has been stated, that is ascertained by measuring it in four directions; but the variation of the arc lamp is so sensitive and is governed by so many different things that it is very hard to determine the actual candle power. You must remember that in a given circuit each one of your lamps strung in the series would have more or less of an effect upon the others. What one lamp might do may affect all of the others in the series, so that in measuring one lamp individually you could not, at any one time depend—not even for half a second—upon that lamp remaining exactly the same. The carbons do not burn with like consistency. If you watch the carbons on an arc lamp where the fitting is of first class material, you will find the carbon points just kind of breathing, you might say—coming and going all the time; always in motion, never absolutely still. Now, you take the heavy carbons and pull them apart for a long distance if you have current strength enough to maintain the arc so that it will not flash out, you can run your candle power to 4,000 or 6,000, as far as the nominal strength is concerned. Some of the search lights on our government war ships run carbon from 1 inch to 1¼ inches in diameter and they pull the arc apart for a distance of half an inch or greater, and, of course, the light is increased that much more; but with half inch standard carbon, and a constant voltage on each individual lamp of from 48 to 52, and with a steady current of 9.6 amperes, you will have every time a nominal 2,000-candle power lamp. That we can prove to ourselves and to anybody else by the register just the same as we do by the daily statement of our street main pressure.

The Secretary—Mr. Schmidt, on page 5 of your paper you say, "I would sooner make a concession on a bill that was unreasonably large through lack of knowledge on part of the consumer than gain an enemy by insisting on the full payment." On what ground do you make a concession in such a case? I think in a case of that kind extreme care ought to be exercised to convince the consumer that you are not making the allowance on account of what you think is a defective meter; and you never want to lose sight of the fact that you believe the meter is correct and you have faith in its accuracy and correctness. If you make this allowance I think it should be in the nature of a rebate, because you see fit to make it and not because of any inaccuracy in the bill or in the meter.

Mr. Schmidt—That has reference to a case of this kind. Many times we have had a new consumer who did not know how to regulate his gas so as to use it economically. Probably he would have a 6-foot tip that he would not take the trouble to turn down. When the bill came in it looked large—and, as a matter of fact, it was large, when you consider the amount of gas which he should have consumed. If we were to insist upon the full payment of such a bill he would probably say, "D—n your gas; take out your meter." If we took out the meter we would lose that consumer, whereas if we gave him a little rebate and instructed him how to use gas in a more economical manner he is very liable to continue as a consumer and keep on burning gas for an indefinite period. We explain how he can reduce his bill by watching the tips and keeping the gas turned down properly. I think in a case of that kind we are justified in making the allowance. Of course we all understand that our meters are all right.

Mr. Butterworth—How does Mr. Schmidt reconcile that sort of conduct with the statement contained in the last paragraph on page five, which says, "If rules are made, enforce them without discrimination."

Mr. Schmidt—If it conflicts with one of our rules of course we can enforce it without hurting our conscience; but a man has to use his own judgment a good deal in such instances to know just what is the best thing to do in view of the interests of both parties.

Mr. Butterworth—I think a decision of our courts is to the effect that a gas company has no right to charge one consumer less than another for gas consumed. The gas company can not make one rate to one consumer and another rate to another consumer, burning gas under the same conditions; but being a quasi public corporation the rate to be charged for the gas must in all instances be uniform.

Mr. Schmidt—That is correct; but at the same time you have to discriminate a little bit.

Mr. Butterworth—When we were discussing the question of the absolute or exact candle power of arc lights, I was going to make the statement that the City Council, at Columbus, Ohio, recently employed Prof. Thomas, of the Ohio State University, to make determinations of the actual candle power of the arc lights furnished on the streets of Columbus. He made some candle power determinations, but what sort of a photometer he used I do not know. Our Secretary, I think, can explain to us about how he determined this candle power.

Mr. Lathrop—I am not very well posted on the matter; but as I understand he made the test by means of a portable photometer, and the report he made to the City Council was that the lamps averaged 1,065-candle power. He does not make the statement that they "nominally" averaged that, but that they did average 1,065 candles.

Mr. Witherby—Are you supposed to be furnishing 2,000 or 1,200-candle power?

Mr. Lathrop—Two thousand.

Mr. Cline—How did he arrive at the average?

Mr. Lathrop—He tested, I think, one lamp on each of 18 circuits, and took the average of those lamps as the average of candle power of the light furnished.

Mr. Butterworth—What I was trying to get at was the kind of photometer he used; how was it constructed and operated?

The Secretary—Well, Mr. Butterworth, if you want me to display my ignorance on electrical matters, probably you had better ask a few more questions of that kind. I do not know what form of photometer it was, any more than it was, as I understand it, a portable photometer.

Mr. Butterworth—Was it a bar photometer?

The Secretary—As I understand, he used an oil lamp as his standard, and as he moved it around the wick would go down and then he would raise the wick to about the point he thought it ought to be, and make his test in that way.

Mr. Schmidt—I do not believe it is possible to measure an arc lamp accurately. The Buckeye Electric Company, of this city, made quite extensive experiments on that line and tried to measure them as accurately as possible, but they ascertained that it was simply impossible for them to use a bar photometer and secure accurate results. At least have not heard of anyone that has been able to devise any means for measuring them accurately.

Mr. Cline—Couldn't they measure these lamps inside a building, using a standard burner?

Mr. Schmidt—The trouble is in the variation in the arc itself. You have your instrument set and it is apt to flare up. The only way is to use an instrument and give it the amount of current that it calls for.

Mr. Witherby—You will find that the "city dads" all object to putting a lamp inside a building. They say immediately that the lamp is fixed and doctored for the purpose. They want you to take the lamps just as they are hung in the streets.

Mr. Holmes—It seems to me the real question, so far as this discussion is concerned, is whether the arc lamp gives 500 candle power or 2,000 candle power. We have been shifting around from pillar to post and apparently evading that particular point. Of course the carbon will change and give us different candle power; but what does it change from? Does it change from 500 to 100, or from 2,000 to 400? I heard Prof. Thomas, who has just been mentioned here, make the statement in one of our electric light convention meetings that he had tested carbons from practically all of the different lighting companies of the State, which were brought in by the students at the State University, and that the carbons gave candle power under the current and pressure already stated of anywhere from 800 to 2,200. That may be a little information on this subject. I do not know how reliable Prof. Thomas' appliances are for figuring candle power, but he evidently has some plan of his own that he considers reliable, and he

suggested to the lighting companies that they look after their carbons more closely. He thought the carbons would give actual 2,000 candle power.

Mr. Schmidt—It would depend also upon the grade of carbon they used.

Mr. Templeton—I saw an actual test some time ago between an arc light and a Welsbach. Of course it was a somewhat difficult matter to measure the light, but all the lights were turned out, except one Welsbach and one arc light, and then a determination was made as to where the point of equal light was between the two lamps. The committee of the City Council, the electric light company and the Gas Company were conducting this experiment for the purpose of informing themselves as to the two lights, and while there was a little difference as to where the point of equal light was, yet all parties agreed substantially in respect to it. The two lamps were 225 feet apart, and it was determined that it was 142 feet from the arc light and 83 feet from the Welsbach. The arc light was using a little less than 400 watts.

Mr. Cline—I do not know anything about the electric light business nor the photometer business; but it occurs to me if you measure electricity in four ways, and get a 2,000-candle power light out of a 500-candle power lamp, you should measure a gas jet in the same way. Figured on the same basis the gas jet that gives 16-candle power should be considered as giving 64 candle power.

The President—I am glad to see that some of the members are coming back to our first love again—gas. Mr. Templeton, you did not state the nominal candle power of the Welsbach lamp in the test which you referred to a moment ago.

Mr. Templeton—I suppose about 60. The rule I believe is in ascertaining the point of equal light to square the two distances, and the result was there was about four times as much light from the arc light as from the Welsbach.

Mr. Jenkins—I move a vote of thanks to Mr. Schmidt for his valuable paper.

Mr. Butterworth—I was about to make a similar motion, but intended to preface it with a preamble. I was about to say Mr. Schmidt's paper could be boiled down into a few words by remarking he advises us that by treating our consumers fairly and honestly we can prevent them from wanting other companies to come in, and by selling our light at as low a price as possible we can remove the incentive for the opposition companies to come in, and in that way avoid competition; but if those means should fail, then, as a last resort, we can combine with them and avoid competition in that way. It is certainly very valuable advice.

Mr. McIlhenny—I second the motion. I believe Mr. Schmidt's paper is one we can do well to think about in the future, and as a result of our deliberations over its contents, much good advice may be obtained from it. He has stated results from practical observation that I think are borne out in other places than his own city along the lines which he has indicated. No one in any paper can do more than that. I think the suggestions which he makes are all correct, and it gives me great pleasure in seconding the motion to extend to him a hearty vote of thanks. (Carried.)

The President then introduced Mr. J. H. Maxon, Supt. Gallipolis (Ohio) Gas Company, who read his paper on

THE WAR OF THE INCANDESCENTS: GAS VERSUS ELECTRIC.

[For Mr. Maxon's paper, see JOURNAL, March 28, p. 493.]

Discussion.

The President—We can all agree with the statement of the paper that the incandescent gas burner is the pride of every gas man's heart; and some valuable suggestions have been advanced by Mr. Maxon in his practice towards pushing the success of those burners. I would like to have a full discussion of this subject. Will Mr. G. T. Thompson, of New York, open the debate?

Mr. Thompson—Mr. President: I am wholly in accord with the sentiments which Mr. Maxon has so well expressed in his valuable paper. I fear, however, that my experience on the practical side, by immediate contact with the manufacture, sale and care of incandescent burners, is too meager to enable me to add much, if anything, to what has already been said. I believe we cannot take too much pains in looking after the burners that are sold. I feel that the agents who sell the burners should be in most cases the gas companies themselves, and I feel that a great deal of harm has been done, is being done, and will be done through the putting out of the burners of an inferior quality by the department stores and by the plumbers who, as Mr. Maxon says have as their only interest the first price to be received from the sale of such burners. But I feel that the best incandescent burners, as Mr. Maxon has so well said, will in the end make their own way. They will tell their own story. They will be their own best argument for the success which will most assuredly attend their continued use.

The President—Mr. Booth, what is your experience?

Mr. Booth—We have never pushed the incandescent burner in our town of Bellaire, Ohio. The natural gas company has the agency there, as it also has at Wheeling, and we have not endeavored particularly to increase its business. That has been our experience with the incandescent burner. We tried to get the agency, but the Welsbach Company thought it could make more money by letting the natural gas company have it than by giving it to us. Since that time we have thrown all the cold water we could on it. While some of our consumers use the Welsbach burner on our gas, they are few in number.

Mr. Cline—Is any other incandescent burner used there, Mr. Booth?

Mr. Booth—Quite a number of different makes have been recently introduced. I do not remember or know the names of them. Several of our people sent to Pittsburgh for another make of incandescent burner and were able to procure them at 19 cents. They can afford to buy them by the dozen when they are bought at that price.

Mr. Cline—Does that price include the mantle, shade and everything complete?

Mr. Booth—It includes the burner complete; that is what they claim to get them for.

The President—I think that is right, for I have heard the same price quoted.

Mr. Booth—And they have put them pretty liberally on the natural gas.

The President—How do the cheap burners work on natural gas?

Mr. Booth—When first put on they do first rate. I cannot see very much difference between them and the Welsbach at the start, but their life is short. Sometimes they stand a week, or maybe two or three weeks, and then they begin to look very sick.

Mr. Holmes—Mr. Booth, what effect has this competition on your sales?

The President—Mr. Booth, you do not need to answer that question, unless you want to. That is, you do not need to incriminate yourself. (Laughter.)

Mr. Booth—I would like to answer that question by asking Mr. Holmes, if an ordinary consumer could buy gas at 20 cents per 1,000 of one kind, and of another kind at $1.20, which would he take?

Mr. Holmes—It does affect your business, then?

Mr. Booth—Of course it does. It has hurt us, and I think it hurts every place where natural gas is used. If we were situated as they are in Wheeling it would not make so much difference. They have natural gas in that city; but as the city own their artificial gas plant, they will not allow natural gas to be used for illuminating purposes. We cannot do that. The consumer uses it for illuminating or for any other purpose he may desire. Of course a great many people ask us whether we think it possible for them to use natural gas in that way for illuminating purposes. We tell them it might be cheaper at the start, but by the time they count the cost of mantles and breakage it might be as expensive as to use our gas in the old way. That is about all the argument we can use against it. If they keep account of the mantles that they break, by the end of the month they perhaps will spend as much money as if they were using artificial gas. We had customers who put in the natural gas and the Welsbach burner at the start and later on threw them out on account of the breakage of mantles—that was when they first came; but since they have become more used to handling them the breakages are not quite so frequent.

The President—What is the situation at Tiffin, Ohio, Mr. McCall?

Mr. McCall—Very few of our residents are using natural gas for illuminating purposes. Electric light is too plentiful and too cheap with us to permit of the sale of any other illuminant to advantage.

Mr. Jones—I would like to ask Mr. Booth, from his experience with the different incandescent burners, what burner he would use—the Welsbach or the 19-cent burner? Which sort of burner has the greatest sale, the Welsbach or the cheap ones?

Mr. Booth—The cheap ones, the reason for which is that the Welsbach people placed their lamp in the hands of the natural gas company who worked it exclusively for natural gas. They did not offer to put it on the artificial gas at all, and some of our people, who are burning artificial gas, wanted an incandescent burner. The man who has charge of the Welsbach did not think it was necessary for him to push the sale of artificial gas, by using the Welsbach for artificial gas purposes; therefore, he would not furnish them. Another man advertised

another burner—I do not kuow what kind of a burner it was—and sold it at about one-half the price charged for the Welsbach burner. He pushed the sale vigorously, canvassing the town from place to place, and every place he could get permission to put it in he did so, either on natural or artificial gas, with the result that he has sold a great many. Probably three of the cheaper burners have been sold to the one Welsbach. This winter, since this Pittsburgh party has been shipping in cheap burners, at 19 cents, many of our citizens have purchased a dozen or two dozen of them. The burners are so cheap they can afford to stock up and buy in larger quantities.

The Secretary—Mr. Maxon spoke about one of the greatest improvements made on the incandescent gas burner by the Welsbach Company as being the adjustable Bunsen tube introduced about a year ago. To my mind it is questionable whether that is an improvement, more especially for house use, where, in dusting around the chandeliers, they are apt to hit that little projection and throw the thing out of adjustment a great deal more than would otherwise be the case. Often when it is thrown out of adjustment no attempt is made to readjust it, with the result that the burner gives poorer service and poorer light with that adjustable Bunsen than it would without it.

Mr. Maxon—I have found that to be the case, not so much in residences as in show windows, where they get in to trim the window. I have had trouble in that way; but I have obviated that difficulty by cutting off the end of the lug, just so I can barely catch a hold of it with a pair of pliers. I never tell anybody about it and never show anyone how to adjust it, for I do not want them to touch it. If you tell them about it and show them how they can adjust it they will spoil all the effects of it. I have never found a consumer yet who would adjust one properly.

The President—I would like to ask Mr. Maxon what course he adopts in a case of this kind: Some consumers allow their lamps to get out of repair and do not want to buy renewals, and such lamps allowed to continue in use become a bad advertisement for the gas company. They give a poor light, and it is a bad thing for both parties. It is against the interest of the gas company to allow the lamp to stand there in that condition. In such a case do you make renewals at your expense, in order that a proper light may be produced? If so, to what extent do you furnish such renewals?

Mr. Maxon—I suppose you refer to where a mantle has burned so long that the candle power is very much reduced?

The President—Yes; or where the lamp is in a dusty place, and the supply of gas is shut off, or something of that kind, so that the light is cut down to 6 or 7 candle power.

Mr. Maxon—If it is the fault of the gas supply, that is easily remedied.

The President—Suppose the mantle is broken or smoked?

Mr. Maxon—If you think the mantle has done its duty, having been in place long enough, and you cannot convince the consumer that he ought to buy a new one and pay you for it, I would fix his light so that he would have to buy one. Arrange it so that he would break the chimney or mantle, and then he would have to put in a new one. I do not think I would furnish a renewal at our expense.

Mr. Whysall—What would the other fellow do that we were talking about a short time ago while this is going on? He does not hesitate to renew lights, when they become so old that they do not give a sufficient amount of light, and I think we will have to do the same thing.

The President—I have adopted that course, to a limited extent.

Mr. Thompson—One matter in connection with this question of "The war of the incandescents" not brought out, either in the paper or in the discussion, is, the growing demand of incandescent gas lighting for street illuminating purposes. By this aid we are enabled to regain some of the gas lamps that have been replaced by arc electric lights. I think it would be a very valuable and pertinent thing for us to consider that feature of the business in this discussion.

The President—I think Mr. Thompson's suggestion is well made and should be considered. We would be glad to hear from anyone who has had experience on this subject of incandescent street lighting.

Mr. Templeton—We have taken it up lately in a very small way; we have been trying for a year over a contract for the public lighting, but have not yet obtained it. In the meantime the electric light company has possession.

The President—That is a very poor showing so far.

Mr. Stevenson—We have about closed a contract with the City Council of Van Wert, not with an idea of displacing arc lights altogether, but moving the arc lights more into the outskirts and lighting that portion of the city where our gas mains are now located with incandescents. As an example, two arc lights, one in front and the other at the back of the County Court House, have been displaced by Welsbach street lamps at each corner, with a saving to the county of $92. We were furnishing those arc lights for $90 a year each, and are furnishing the street gas lamps for $25 apiece. The change was made in order to save to the county that amount of money.

The President—How long have they been running?

Mr. Stevenson—About two months.

The President—You cannot tell, then, the life of a mantle under such conditions?

Mr. Stevenson—No; they have not been running long enough; but I have been experimenting since last August with Welsbach street lamps and find the life of a mantle to be about two months. The Welsbach Street Lighting Company furnishes six mantles as a starter with each lamp, and, from all I can understand, if six are not enough, it will furnish more. The Welsbach Street Lighting Company stands good for all breakage of globes and domes and that sort of thing. In New York they are lighting very extensively in this way. I have just returned from a trip east and was surprised at the extent to which they are used on some of the boulevards, and they have proved very satisfactory to everyone.

The President—Is it a single gas lamp, or a cluster of lamps?

Mr. Stevenson—Usually single lamps are used, but they make them double, and even four, and six, and more. I think the time is rapidly coming when incandescent gas lamps will be generally used on the streets.

Mr. Jenkins—I have had some experience in Covington, Ky., regarding the number of mantles annually furnished by the Welsbach Street Lighting Company, of America. They furnish six mantles per annum only and no more; at least, they would not to our Company. They made a contract with us at so much per annum, they furnishing the top, frame, post, riser, lighting attachments and everything of that kind, renewed the domes and globes, and furnished six mantles at so much per year. That price I think is a little higher than they are asking at the present time. I found also, Mr. President, that it takes considerably more than six mantles per year on outside lighting. However, we were using these Welsbach's at the approach to the Suspension Bridge, at the Cincinnati end. We put them up from the Covington side and the Cincinnati Gas Company furnished the gas. We were trying it as an experiment in the street lighting business.

Mr. Maxon—Wouldn't the jar at such a place be greater than on an ordinary street?

Mr. Jenkins—This was almost a solid masonry approach. There was more jar of course than there would be on the street, but still I have noticed practically the same results in lamps differently situated. In front of the gas office in Covington I placed a three-light cluster of Welsbachs, and at first the mantles went to pieces very rapidly. Afterwards we put home-made, anti-vibrators upon the lamps and the mantles lasted about five times as long; but even then we could not count on more than one month for the lifetime of a mantle, on account of the jar. I think, however, the improvements made since that time have enabled them to attain better results in this respect. I was informed recently that they perfected an anti-vibrator that was causing the lamps to work better, and they are now getting it down to a fine point. I am very much impressed with the idea that they will do a large part of the street lighting in the next few years; and I think it is a feature of our business that we can improve and extend more rapidly in the near future. It depends, however, to a great extent upon what the Welsbach Company are going to charge us for this apparatus. In a proposition recently made to the authorities of Richmond, Va., they asked $30 a year per lamp, and offered to pay the city $12 a year for gas, which brings the cost of maintaining the light to $18 a year. Many of us would like to get a contract to furnish the gas at that price.

Mr. Cline—Would that be two lights, or one?

Mr. Jenkins—One light. I think, however, the Welsbach Street Lighting Company will probably be in a position to make these contracts considerably lower.

The President—Another suggestion in the paper that I think is worthy of discussion, refers to the new mantle made by the Welsbach Company, which is claimed to be an improvement over the No. 169. Have any of the members had any experience with the new mantle? If so, we would like to hear what they have to say in reference to it, by way of commendation or otherwise?

Mr. Maxon—The new mantles have not been on the market long enough to enable one to speak positively on that point. One matter that I endeavored to bring out, and which I believe to be a mistake, is the suggestion of the Welsbach Company that their agents should ad-

vise and induce their customers to put the mantle on themselves; that the people purchasing the burners should make the renewals themselves.

The President—Don't you think it a disadvantage to change the form of mantle?

Mr. Maxon—My experience with these new mantles causes me to like them very much; although I would as soon handle the old one, as far as the rapidity of the work or convenience of it is concerned. The new mantles seem to be very good.

The Secretary—The new mantles, if I remember rightly, are suspended by a little asbestos loop, rather than a platinum wire as the old ones were, are they not?

Mr. Maxon—No; these that I received are suspended by a platinum wire.

The Secretary—They sent us some that were suspended by an asbestos loop, but I do not think they are as good as those suspended by the platinum wire; and, besides that, with the old style we can get an allowance for the wires when returned.

The President—This new mantle is suspended by a platinum wire, as I understand it, and embedded in a brass cap that fits right over the lamp?

Mr. Maxon—A corrugated cap, which goes over the burner and holds the gauze, is furnished with each mantle. The support is fastened to that cap by a riveted clip and, in putting on the new mantle, you remove the old cap each time. They claim an advantage in this regard because you don't have to use a cap having an old, rusty or clogged up gauze.

Mr. Holmes—Does the candle power of the new mantle run higher than the old one?

Mr. Maxon—I would not be positive that it does, but it seems to me to run higher. Just judging by looking at it, with the short experience I have had with it, I should say it was better than those I received before.

On motion of Mr. Cline, a vote of thanks was passed to Mr. Maxon for his very excellent paper.

The President at this point ordered a recess, the Association to reassemble at 2:30 P.M.

FIRST DAY—AFTERNOON SESSION.

The President called the meeting to order, pursuant to adjournment.

Mr. J. W. R. Cline presented the following

REPORT FROM COMMITTEE ON NEXT PLACE OF MEETING.

Mr. President and Gentlemen: The Committee had a meeting just after the adjournment of the morning session. There were no cities which asked for the meeting of the Association next year except Springfield, and the Committee were unanimously in favor of reporting that place for the next meeting of the Association. I will read you a letter from the Commercial Club, of Springfield, inviting the Association to meet there next year:

"Mr. J. W. R. Cline, Springfield, Ohio: My dear sir: Will you please, on behalf of the Commercial Club of this city, invite the Ohio Gas Light Association to hold their next annual meeting in Springfield, Ohio, which is centrally located and favorably situated as to railroads, and is supplied with all the up-to date accessories of life in a modern city, which will afford them every facility and convenience for the transaction of their business. Our people will cordially welcome them and will endeavor in every way possible to make their stay in our city both pleasant and profitable. Very truly yours,

"D. T. WEST, Sec. Commercial Club."

The Committee have, therefore, recommended Springfield as the place for the next meeting of our Association.

On motion of Mr. Holmes the report was adopted.

Mr. Irvin Butterworth, General Manager Columbus (Ohio) Gas Company, read his paper entitled

STILL ANOTHER PURIFYING BOX.

[For Mr. Butterworth's paper, see JOURNAL, March 28, p. 494.]

Discussion.

The President—Gentlemen, we are certainly indebted to Mr. Butterworth for this paper, not only as members of this Association but also as representing the gas industry of the State. I hope we shall have a full discussion upon it. I will call upon Mr. Greenough to open the discussion.

Mr. Grenough—I do not think it quite the proper thing to call upon a man to criticize a paper of which he has only been able to hear a part, and who certainly had no expectation beforehand of speaking upon it. I have no criticism whatever to offer on the paper offhand. If you can put up a purifying house in this way I do not see any reason why it would not work successfully. The ordinary feeling, I think, of gas people in this country in the last ten years has been that they have gotten about as far as they could go in the process of purifying gas cheaply, and there has not been, perhaps, so much attention devoted to changing or improving the systems of purifiers as in other parts of the works until within the last year, when we have had three of these new schemes sprung upon us. I have no suggestion to make as to why the plan referred to by Mr. Butterworth should not work. It seems to me very likely it would work. It does not seem to me that our present purifying boxes allow the gas as a rule to pass around the edges, but it seems to me the material being turned over in the boxes is thoroughly saturated all through with sulphur. I do not think it is the experience of most of us that the present method of manufacture fails to foul the oxide. If these boxes can be constructed more cheaply than the ordinary system of purification, I see no reason why this box should not work successfully. I think the box would work better than the one presented to us at the Old Point Comfort meeting of the American Association; but the only proof of a purifier is the test which is applied in connection with the pudding, and that is to construct the purifier and see how the thing will work, and what effect it will have upon the digestion of the person who undertakes to operate it.

Mr. Whysall being called on by the chair, said: Mr. President, I have not had enough experience with purifying boxes to render an intelligent opinion. I think, however, that the box will work and will do the work well.

The President—Mr. Donald McDonald, of Louisville, ought to have some views on this subject.

Mr. McDonald—Well, all I have to say about it is I am not at all suspicious. If the passage of the gas through the oxide will purify it there is no reason on earth why you should adopt one way, and that an expensive way, and stick to it, after something better has been successfully used. It seems to me Mr. Butterworth has shown us a plan by which, with a very cheap and inexpensive apparatus, you can compel the gas to go through the oxide. That done, I do not see why anyone should start anew and build the ordinary form of box which seems very much more expensive. Of course, a man having the ordinary form of box would not think of throwing it away for the purpose of building one like this; but the problem will present itself to the man who has a new purifying apparatus to construct as to whether or not he shall go to the trouble of building these immense boxes, with covers to be lifted, when he can accomplish the same result at much less expense. That is all any box can do, and it seems to me this will do it. However, I may say just exactly what Mr. Whysall has said, that having had so little experience in this line my opinion is not worth much.

Mr. Chollar (St. Louis, Mo.), being called on by the Chair, said: So far as the paper is concerned, Mr. Butterworth has undoubtedly taken a very safe position, because no one would attempt to deny the statements that he has made in regard to it. Mr. Greenough hit the nail on the head exactly I think when he said that Mr. Butterworth and Mr. Doherty having invented and perfected a system, it is now for them to build the box and experiment with it until its success has been assured. Then, in three or four years hence, they may come before the Association and give us the benefit of a paper discussing the practical success of the box, and its many points of advantage. The question is, will it work? It reminds me very considerably of an experiment we tried in St. Louis in another line six or seven years ago, shortly after we started the water gas apparatus. We passed the gas into a relief holder at only one inlet pipe. It was desirable to take the gas from a branch of that pipe and connect it to the foul main between the hydraulic main and the exhauster, where we had a vacuum of about 2 inches. We wanted to make the connection and keep the works running. After a good deal of study (which Mr. Butterworth has undoubtedly given to this subject from the nature of the paper just read), we devised a scheme whereby we thought we would risk it. We put a 16-inch saddle on the side of a 20-inch main and made the connection without stopping the works or shutting off the flow of gas. We had a good deal of doubt whether it would work or not, but we studied it out and ultimately found that it worked. It is to be hoped that the process suggested by Mr. Butterworth will work with equal success.

Mr. Thompson being called on by the Chair, spoke as follows: Mr. President, Mr. Butterworth described this box in correspondence with me some six weeks ago, and I hit it about as hard as I could then by way of criticism on general principles. Some of the points of criticism

which I then raised seem to have been met by the text of Mr. Butterworth's paper. The point which struck me as being the most vital one, as threatening the possible failure of the oxide to foul thoroughly, was that the gas in entering the outlet cage would take the lines of least resistance and pass directly to the inlet cage through the shortest possible distance. In other words, it would leave unfouled, at first, the corners of the box, and the entire space at the top of the box above the level of the top of the outlet cage. Mr. Butterworth's present arrangement, of rounding the corners and mounding the oxide at sides and end, overcomes, to a large degree, my criticism on that point. I can agree thoroughly with Mr. Greenough, and with Mr. Chollar, that the only way to do is to build one of these boxes and try it. I believe it is practically determined that such a box will be built during the present season and installed in the works under the care of Mr. Doherty.

Mr. Doherty—Mr. President, one word in regard to the questions raised by Messrs. Greenough, Chollar and Thompson. That box can be constructed the same as the Beal box on end, and I think it would work just as well as the Beal box, and, in fact, much better than a horizontal box. You will find a tendency in gas to crawl along the walls of the generator or the purifier, and I think if you visit the Cleveland gas works—unless they have tramped their boxes around the corners so that the oxide at that point is very dense and has been pressed hard against the sides of the cage—you will find the tendency of the oxide, on a cross section right through the box, is to foul up in this fashion. If you take the box that has been the first box of a series of boxes for a long time, that rounding up will not make itself very apparent, because after it fouls to the top against the wall of the box it cannot foul any more there, but it will foul gradually to the top all the way around. In other words, if you can run that box long enough in a series of ordinary horizontal boxes as the first box, the oxide will be uniformly fouled; but if you take the box and simply drop the material in an ordinary, loose, porous state, I think you will find that the gas will first come through unfouled at the corners, and then it will foul at the sides all the way along, but the tendency is almost double at the corners for the gas to travel through without being purified. If you take our box and extend the outlet cage from end to end it does not differ very much from the Beal box, except that it is set on end, permitting more convenience in dumping. Another great advantage it has is that you can use very fine material in it. If you notice the slatting you will see that the material would not drop through the slats, nor would it have a tendency to bind and cake. When I designed the box my original idea was to let the gas come in at the center, but I readily saw that was an error, for you want a great deal more space at the point of entrance than at the point of outlet, so I turned it around and built the box the other way. My original intention was to construct a cylindrical box. Afterwards I turned it over to Mr. Butterworth, who got up the slat arrangement and perfected its details. The box can be changed, if desired, so that the outlet cage runs from end to end; but then you have two vertical beds separated by a long and narrow vertical outlet cage, giving an opportunity to the gas to travel along lines of least resistance at the point of contact with the oxide and wall of box. I hold there is no point of resistance so small that gas is apt to foul in one place much sooner than it fouls in the whole box.

Mr. Thompson—I might add that, in my correspondence with Mr. Butterworth, I suggested overcoming the objections to the non-fouling of the corners by running the outlet cage the entire length of the box. His reply was he would not give two cents for the box if it needed that alteration.

Mr. Butterworth—I meant by that simply this, that it would be so little better than the ordinary purifying box that I would not fool with it any longer. I did not mean the box would not be worth two cents; I meant that I would not give two cents to fool with it any longer, if that had to be done.

Mr. Thompson—I fail to see the distinction.

Mr. Butterworth—It is a very marked distinction to my mind. I would not give two cents for such a box as against another.

The President—Mr. Coombs has given some attention to purification and we would like to hear from him.

Mr. Coombs—Mr. President, the box that Mr. Butterworth has made I know nothing about, but I believe, from the illustration and description given of it, that it is practical, and I see no reason why it should not prove a success. It seems to me his ideas are about correct on the subject of running the oxide in two layers. I think it will come out all right, and see no reason why it should not prove a success.

Mr. Doherty—Of course it is a very easy matter to determine whether the box is a success by putting it in practical operation. We have already made arrangements to install one of the boxes, but it was our desire to bring the matter before the Association at this time, so that the members might discuss its various points with a view to preventing us from making errors. If anybody can tell us why the box will not work I would esteem it a favor if he would do so. We are inviting criticism, and the mere fact that the box has not been installed is no reason why it should not receive the fullest criticism. The intention of the paper, I think, was to invite criticism to determine if any weak points presented themselves to the members. Weak points which were suggested by Mr. Thompson and others have been, at least partially, cured. If any other weak points exist in the box as at present constructed, we would like to have them pointed out, and will try to remedy them.

On motion of Mr. Holmes, a vote of thanks was passed to Mr. Butterworth for his excellent paper.

The President then asked Mr. Moses Coombs, Superintendent of the Youngstown (Ohio) Gas Company, to read his paper on the subject of

COMPARATIVE RESULTS WITH AND WITHOUT THE USE OF A CONTINUOUS OXIDE REVIVIFIER.

[For Mr. Coombs' paper, see JOURNAL, March 28, p. 496.]

Mr. Coombs prefaced the reading of his paper with the following remarks: Mr. President and Gentlemen: I believe it will be fair for me to make a statement before I proceed with this paper, for one or two items were omitted that should have been mentioned in it. I should have said that we are making coal gas, using Youghiogheny coal and about 10 per cent. cannel. Another item that should have been a little different is in reference to the sketch of the purifier. That represents the boxes as they are used; but instead of four being charged there are only two. We have four boxes running, but only two in operation charged like the cut.

Discussion.

The President—Mr. Coombs has furnished us a very interesting paper, drawn from practical experience. The subject is now before you for discussion.

Mr. Templeton—What is the effect of air on the candle power?

Mr. Coombs—There is no decrease in candle power if we do not use to exceed 2¼ to 2½ per cent. of air.

Mr. McDonald—What effect did the air have on the bellows of the meter, or on the meter itself? In other words, could you use the ordinary tin meter for that service?

Mr. Coombs—Yes; but it would take about one meter a year to do it.

Mr. Doherty—Do I understand that you do not notice any decrease in the candle power of the gas unless you get above 2½ per cent.?

Mr. Coombs—Yes, sir.

Mr. Doherty—In another place you speak about the result per bushel of oxide. It seems to me that would be more accurate if you figured it out in units of labor; for the oxide in the end, I think, would take just about the same amount of sulphur in either case. Another point I want to bring out here that perhaps some of you have noticed—I have noticed it, but cannot explain it. I have not had the time to follow it up, and thought I would not say anything about it until the time came when I could look into it and see if there was anything in it. I have tried, at the works with which I am connected (Madison, Wisconsin), putting air in with gas, and it seems to me that I could notice an odor from my gas stove—I heat my sleeping apartments with an open-flame gas stove, without any flue connection—and I could almost determine whether they were using air or not with the gas by the presence or absence of a peculiar odor in the room. Without the use of air I could not detect any odor at all. I spoke to Mr. Cowdery about it, and he said he had noticed the same phenomenon. I do not know exactly how to explain it. Perhaps some one here has noticed the same peculiarity and can explain it. Now, as I take it, Mr. Coombs is not trying to revivify by just simply putting air through the box without the gas?

Mr. Coombs—The air is used with the gas.

Mr. Doherty—Have you ever tried it the other way?

Mr. Coombs—No; this air is put in where the gas is passed through the boxes.

Mr. Doherty—The best result I have been able to get so far, with two purifiers, has been by throwing one off and putting air through it, just revivifying it in the box, but without the gas going with it. I have gotten a greater degree of purification per bushel of oxide in this manner. And it has seemed a great deal safer, because when the box fouls on you, when you are putting in a certain percentage of air with your gas, I have often found it will not revivify. Whereas you can always put a great deal of dependence on revivification if you don't put air in with your gas.

Mr. Coombs—We have three boxes in operation; we have four altogether, but three used continuously. About the matter of odor that Mr. Doherty seemed to detect in using a gas stove when he introduced air through the purifiers while in operation, I experienced the same thing. After that I put in the top layer of lime, which you see represented in the diagram. That was done to correct that matter, and I think it has been a success. Why it does it or how it does it I do not know; but we have experienced the same trouble reported by Mr. Doherty. Another matter occurred that I can not understand. Probably some gentleman can give me information about it. When we were revivifying out of position, handling the oxide and throwing it out in that way, occasionally we would find an increased back pressure in the boxes; so much so that we would have to change before the boxes beeame foul. On taking off the cover we would have to loosen the oxide with a pick and shovel; but after introducing the air continuously in the boxes, although we have not experienced any increased back pressure whatever, when we empty the box again, which we do when we put in air in a continuous way, we find the oxide as hard as ever and have to take it out with a pick and shovel. That is something I can not account for; and it is quite a nuisance to have a pretty heavy back pressure come to you in the winter time. We have not experienced any of that trouble whatever when we introduced the air as I have suggested in the boxes, although when we go to the boxes to get out the oxide it would be almost as hard as stone.

Mr. Doherty—What does your oxide consist of, Mr. Coombs?

Mr. Coombs—It is a mixture of about 14 to 1. We make our sponge of sawdust and iron filings.

Mr. Maxon—I would like to ask Mr. Coombs if the lime on his top tray, after leaving it in the purifier so long, doesn't become packed and cause back pressure?

Mr. Coombs—Yes, it would become packed and caked; but we stopped that by mixing it with planer chips.

The President—Mr. Eysenbach, what is your experience at Columbus in this regard?

Mr. Eysenbach—I have noticed the smell that Mr. Doherty speaks about, but I think if he mixed air with the gas as it went in he would not notice it. I think running the air in the boxes afterward is what produced that odor.

The President—Mr. Doherty, when was it you noticed that odor?

Mr. Doherty—When the air was put in with the gas.

Mr. Thompson—Why does Mr. Coombs use lime and planer chips on top of his oxide? That lime must certainly become carbonated very early in its life, and after that time has no more efficiency than an equivalent quantity of planer chips or breeze.

Mr. Coombs—I put the lime on the top tray of the purifier for the purpose of remedying the odor which has been spoken of, and with a view to extracting the carbonic acid from the gas. The planer chips don't amount to a hill of beans, but the lime seems to stop the odor that comes from the gas and also extracts the carbonic acid. Lime is a very good thing to have in the outside boxes, because it will, as far as it goes, increase the candle power. It takes out the carbonic acid. It will do that as far as it reaches. I do not say I had enough lime to complete this work clear through until the box became charged again, but I put it in as far as it would reach. It probably increased our candle power something like 1 candle, and that means a good deal sometimes.

Mr. Donald McDonald—This reference about bad odors from gas stove interests me very much, and I know something about it. I do not know why it is, but I do know this, that no matter how well your gas is purified, you cannot use artificial gas in a Bunsen flame without getting a sweetish, disagreeable odor, and where you burn with a straight or luminous flame, and have an atmospheric mixer, there is no odor from it. But there is a great difference in stoves.

Mr. Doherty—Is this peculiar to the Bunsen flame?

Mr. McDonald—By a Bunsen flame I mean a flame that draws in some air to mix with the gas; and of course air added at the gas works would have exactly the same effect as air added at the stove. But what is absolutely amazing to me is that the addition of that lime in the purifying box would or could rectify it. Because I know if gas comes right into the house properly purified and you burn it in a stove with an atmospheric mixer and a Bunsen flame you will get a sweetish, disagreeable odor. I do not know why it is. If anybody does I would like to be enlightened, and would be still better satisfied if anybody could state a remedy for it.

The President—I thought I noticed a difference in the degree of the odor from different makes of stoves, even with the Bunsen burner.

Mr. McDonald—There is a great difference in the degree of the smell, but I have never seen a Bunsen burner that did not give forth a sweetish, disagreeable odor; I have seen some that were very much worse than others.

The President—Have you ever noticed similar trouble with the Welsbach burner?

Mr. McDonald—I never noticed it with the Welsbach burner. I presume the combustion is more perfect.

The President—In reference to that matter in a closed room, with a Welsbach burner you will notice the odor.

Mr. McDonald—I never noticed it.

The President—Mr. Lathrop tells me that he has had the same experience. Are there any further remarks?

Mr. Chollar—I have read somewhere—I do not remember where—that the particular disagreeable odor in the use of the Bunsen burner is due to an imperfect mixture to a slight extent and to imperfect combustion whereby a small quantity of acetylene gas is set free. If the gentleman will remember there is a marked similarity between the smell to which he refers and to the smell of acetylene gas. Why that is true I do not know. The smell is very marked in a gas stove when you put a vessel of cold water by it.

Mr. McDonald—I think Mr. Chollar has reference to something else than the immediate point under discussion. The odor that comes from putting a vessel of cold water down near the flame is "acrolein," so an eminent chemist tells me. Another fact which puzzles me is that, natural gas, burning in a Bunsen burner, does not give any odor, while artificial gas, burned in the way I have stated, does give the sweetish, disagreeable smell. Acetylene odor is not irritating to the eyes or throat, but is simply disagreeable.

Mr. Thompson—We know that the production of acetylene gas from a Bunsen flame, when it strikes back and burns at the base, does yield a pungent, sweetish, disagreeable acetylene smell. It has occurred to me that possibly the smell which we get, when a percentage of air is introduced into the purifier, or during purification, might be due to the production of a small proportion of sulphurous acid. My chemistry may be off on that—I have not worked out the reaction; but it is among the possibilities that that reaction may occur.

Mr. McDonald—Why do you refer to the production of sulphurous acid in a Bunsen burner flame?

Mr. Thompson—I am not referring to the production of sulphurous acid in a Bunsen flame, but I am speaking of the action of the air upon the sulphureted hydrogen. Now, in Mr. Doherty's case as I understand it, where he uses his heater in his sleeping apartments he did not use a Bunsen flame, but an open flame.

Mr. McDonald—But he got the equivalent of the Bunsen flame when he added the air at the gas works, and that is exactly what I am saying.

Mr. Thompson—I want to ask Mr. Coombs if, by placing the pressure gauge, which is shown at the right hand of his sketch, on the pipe *above* the point at which the air is admitted, he gets a true reading of the degree of vacuum? In other words, his air is admitted between the gauge and the meter inlet, and it would seem to me that the atmospheric pressure would be indicated upon the gauge, rather than any near approach to the degree of vacuum caused by the steam-jet exhauster or injector.

Mr. Coombs—I don't understand you, Mr. Thompson. Repeat that, if you please.

Mr. Thompson—In other words, if you place your presssure gauge on the outlet to the meter, where the action of the steam-jet exhauster or injector would affect it, you would be able to ascertain just exactly what degree of vacuum you were exerting; whereas if you place it here, as indicated in the sketch, the atmospheric pressure will affect it through this inlet air pipe and you will not get a registration of as great a degree of vacuum as you actually are exerting.

Mr. Coombs—It might not be exactly accurate, but sufficiently for practical purposes. This will probably vary from ½ to 1 inch. If it varies either one way or the other it is very easily changed. It is not necessary that it should work exactly accurate.

Mr. Thompson—The point I was driving at was more especially this: From a reference in the paper it seems that Mr. Coombs depends, to some extent at least, upon the degree of vacuum, as shown on these gauges, for a check upon his meter readings. Now the greatest trouble which I have found in introducing air during purification is that the meters will not stand the racket. I have tried revivifying *in situ;* I have tried it in the off boxes, and in both cases have done it with and without steam, by the Dexter or the Carpenter process; I have tried dry meters, with steam injected into them in order to keep the leathers moist, and I have tried it with wet meters, with galvanized iron drums and copper drums. It is a very difficult thing to get an accurate meas-

uring instrument for your air which will continue to do the work and not deteriorate very quickly.

Mr. Coombs—Mr. Thompson speaks probably from a position much different to mine. He is speaking from the standpoint of a large plant, whereas ours is small. We have not experienced any trouble whatever with our meters.

Mr. Thompson—As you say the deterioration is such that it will require a new meter about every year.

Mr. Coombs—It will wear out in about a year.

Mr. Thompson—The principle is just the same, Mr. Coombs, whether it is in a large plant or in a small one.

On motion of Mr. Schmidt a vote of thanks was tendered to Mr. Coombs for his excellent paper.

QUESTION BOX.

The President—As we have some time at our disposal before adjournment, we might discuss some of the questions in the Question Box.

Question No. 1.—"Is natural gas growing as a competitor of manufactured gas, when used in Welsbach burners?"

It having been suggested that this subject be taken up in executive session, if there is no objection to that course we will discuss this question at that time.

Question No. 2.—"What is the best form of indentation in the side of the hub of a pipe to insure the best joint?"

We will now take up the discussion of this question, and I will ask the members to keep as closely as possible to the subject in order that we may utilize our time and act intelligently on each question.

Mr. Whysall—I presume this question refers to the connecting of services with street mains.

The Secretary—I think, Mr. Whysall, from the character of the sketch which came with this question, that it more especially refers to the shape of the hub.

Mr. Whysall—I have had considerable experience with lead joint pipes under high pressure—200 to 300 pounds—and found that the less space for the lead the better the joints. If a large space is left for the lead, it is very difficult to drive it up and have it stay. On a 12-inch pipe we find that a base of $\frac{5}{8}$ inch gives the best result, and the total depth, or rather width, of lead at the widest point, is $\frac{5}{8}$ inch with a depth of 2 inches in the hub.

The President—If there are no further remarks in response to this question, I will read the next one.

Question No. 3.—"What effect will acetylene gas machines have on gas companies?"

Mr. Jenkins—I think that subject, together with several other questions of kindred character in the Question Box, should be brought up in executive session.

The President—If there is no objection we will consider the subject of acetylene gas in executive session.

Question No. 4.—"What is the best manner of locating leaks in gas mains and services?"

I will call on Mr. Jenkins, who has had a good deal of experience in that direction, to tell us the best way to locate leaks.

Mr. Jenkins—Well, I would hardly say that my way is the best. I think, though, gentlemen, the only way to locate leaks is by persistent, everyday, hard work; and that work has to be done according to your local conditions. Take a town, for instance, like Columbus, Georgia, in which there are no asphalt or brick paved streets—in fact, not even macadamized streets—and you can locate a leak there rapidly and easily. On the other hand, in a city like Cleveland, with its miles and miles of asphalt, brick and stone block paved streets, and nothing but that has at least a macadamized cover, it is a very difficult thing to locate leaks. One way I have always followed, in the winter time especially, is to have a gang of men go thoroughly over the service boxes, and, lifting their lids, try to detect any smell of gas. Recently we have located some half dozen serious leaks in that way. As I stated in my paper on leakage, at Cincinnati, a couple of years ago, that is one good use to which you can put the street stop box—by it you can trace leaks. Of course, aside from that is the regular work you all know about, but I know of no better way than, as I stated in the beginning, persistent, hard, everyday work. And there is no other part of your work that will pay you better than to put your leakage down to the lowest possible point.

Mr. Schmidt—At Sandusky we encounter a good deal of rock, and it is almost impossible to locate a leak by boring, because the gas will follow along the pipe. The only way we can locate a leak in many instances is to divide the main into sections and dig down to find which way the gas is flowing; then we go ahead a little farther and try it again until we are able to find where the leak is. Our soil is so porous that it is practically impossible to locate a leak in any other way.

Mr. Coombs.—At what does Mr. Schmidt estimate the average amount of gas that he loses per mile of street main in a town of about his size? Before he answers that question I will tell him about the condition of the mains in Youngstown, and then the comparison can be made. We have about 20 miles of street mains, and our average loss is about 300,000 cubic feet per month. If we figure it by percentage we seem to be a trifle off the track, but taking it by the mile would give a more definite idea. I would like to get some idea in a general way from different members of the Association in reference to this matter by comparing results to determine where we should be.

Mr. Schmidt—At one time our leakage was about 25 per cent., but we have reduced it to about 12 per cent., and have not discontinued our efforts to do even better. You can only do it by hard and persistent work. You have to keep it up all the time. As many of our mains were put down 50 years ago, we have to gradually continue replacing the old mains and services.

The President—In connection with this topic Question 13 may also be taken up.

Question No. 13.—"How great a pressure can be exerted on pipes laid with cement joints without injuring the joints?"

Mr. McDonald—If that means how great a pressure of gas, I would say that you could burst a cast iron pipe long before you would blow out a Portland cement joint; but if it means how great a pressure, applied to the pipe, with that purpose in view, is a different thing. Most of our pipes have screw joints. Our lead joints are very unsatisfactory. I have been looking into the question of cement joints because I am very much interested in this subject. If the author of this question fears injury to a cement joint by pressure from the gas, I think he is afraid of the wrong ghost, for there is no pressure you could put upon a Portland cement joint that would ever blow it out.

Mr. Thompson—I think Mr. McDonald misapprehends the intent of the question. While I did not ask the question, yet I think the intent of the question is how great a pressure you can put on a joint without occasioning a leak.

Mr. McDonald—The question does not say so.

Mr. Thompson—If the joint leaks it is injured, isn't it? That is the language of the question.

Mr. McDonald—I think we would have to know in order to answer that question whether a joint freshly made is meant, or whether by it is meant after the joint has had time to set and to become hard.

Mr. Mayers—The Columbus Gas Company laid a mile of 24-inch main with cement joints, and lead every fifth joint. The cement joints were made out of Louisville cement, and the bells of the pipes were made especially for that purpose. The bells of the pipes were made larger for cement than for lead, for the reason that as the men in making the cement joints used rubber mits they could push their hands or fingers farther into the bowl of the pipe. The leakage, when we started out to make them, was very great for several reasons. We had poor cement, and the man in charge of making the joints was too old for that kind of work. We soon discovered it, however, and put on a younger man who was strong and reliable. The results of the first day's work were 32 or 33 of these 24-inch cement joints, and no leakage whatever. The pressure put on the mains was 16 inches. The joints were first yarned, then stuffed with cement, mixed rather soft, then yarn was placed around the joint and rammed fairly tight, after which it was left to set for perhaps 15 to 20 minutes. The yarn was then taken off and the joint was again wiped again with cement, mixed stiffer. I think much depends upon pressing the cement firmly into the bell of the pipe, by means of the hands, the latter being covered with a rubber mit. We found that ordinary, fingered gloves made holes in the cement rather than leaving a solid, homogeneous mass. After these preliminary experiments and difficulties the cement held tight for the rest of the work. The first week or two it was more expensive to make cement than lead joints, because they had to be remade so often—more than 75 per cent. of the work of the first week or two had to be taken out and put back again. We had to make these cement joints a success because the bells of the pipe were made so large that the cost of lead would have been too great. Such has been our experience in the use of cement in making joints.

Mr. McDonald—After making these joints, how did you ascertain there was no leakage?

Mr. Mayers—We tested them in two ways; by means of a U-gauge and by means of soap suds.

Mr. McDonald—The reason I ask is because I attempted a similar experiment and was unable to make the joints so that they did not leak.

Mr. Mayers—The first two weeks were taken up pretty much in experimenting, but when we found out exactly what the matter was we remedied it, since which time we have not had any difficulty. As I said, the lack of success in the beginning was the result of poor cement, and the kind of labor we were employing.

Mr. McDonald—What kind of cement did you finally use?

Mr. Mayers—"Fern leaf;" a brand of Louisville cement.

Mr. McDonald—In making your test, did you use soap suds over the joint, or a U-gauge on it, so that you could see if the pressure went down?

Mr. Mayers—We pumped the main up to 16 inches, and had a U-gauge at both ends of the line—one at the works and one at the other end—and the test was made, not only with soap suds, but the U-gauge was watched so that any loss of pressure was noted. It was gone over with both of these tests. The length of time that we kept up the pressure and the soap suds' test was noted in each instance. In doing this work we were very careful to make the lead joints first, so as not to have the jar on the cement joint occasioned by the caulking of the lead joints.

Mr. McDonald—A 16-inch pipe will lose a good deal of air before it will show much fall in pressure.

Mr. Mayers—But when you have the other test, and use the two in connection with each other, I think it will be disclosed with reasonable accuracy whether or not there is any leakage.

Mr. McDonald—I experimented along this line to a limited scale. I took a 2-inch collar, filled one end of it with Portland cement, put a reducer or bushing in the other end and turned the gas into it. There was no leakage large enough to be lighted, but when the U-gauge was put on leakage was shown. This leakage I found was due to a very minute crack between the iron and the cement collar around the fitting, evidently traceable to the expansion of the iron or the contraction of the cement. I found also when the smooth surface which the trowel had made on the outside of the cement was filed off, there was some leakage through the pores of the cement. Before I began to examine it very closely under high pressure I found the difference to be very slight, but a crack had opened, probably one one-thousandth part of an inch; however, it was enough to let the gas in between the iron and the cement and I do not see how that can be avoided.

Mr. Mayers—I believe the co-efficient of expansion of some cements and iron is about the same.

Mr. McDonald—I meant the shrinkage at setting; not after the setting, but at the time of setting.

Mr. Templeton—We have laid a few miles of pipe with cement joints in the last five years. Mr. Stone, of Ashtabula, under whose supervision the joints were laid, is here and can give you his experience.

Mr. Stone—I have had some experience in making cement joints, and at first I had considerable doubt in regard to whether the practice would be justifiable. The largest joints were 12 inch, and the smallest 4-inch. Before we began work I wished to satisfy myself that the joint could be safely made, and I caulked two lengths of 12 inch pipe together the same as if I were going to place them in a trench. I put a tap on one end and a plug in the bell, and allowed the cement to set for 24 hours. Then I put on the pressure gauge, up to the point of securing the equivalent of 12 pounds pressure on the pipe, after having allowed the cement to set for 12 or 15 hours. So far as leakage was concerned, it was tight. The gauge stood right up, just the same as it would on a lead job. Then I wondered if the joint would break or spring a leak if the gas main happened to be laid over a sewer, or if the ground should sink under it, or if weight from above would come upon the joint. I allowed the pipe and the joint to set for nearly a week, and then placed the pipe so that the weight of the pipe came on the middle joint, allowing the ends to swing—it was a 12-inch pipe, 70 pounds per foot, which made approximately 840 pounds on each end, or a total of about 1,680 pounds on both ends, resting right on the middle of the two lengths of pipe. It did not "phase" it. Then I had two or three of the men sit on each end of the pipe and play see-saw, but that did not affect it. After that experiment I was satisfied that cement joints could be made and could be made tight. Since that time we have laid about 15 miles. Some poor cement we used about a year ago resulted in joints that were not satisfactory and which we had to caulk over. Fortunately, however, I discovered that the cement was bad before I had completely finished the job, so we went over that section where the poor cement had been used and re-caulked the joints. We put a meter on the 2½ miles, with a pressure adjustment of about 3½ inches, and the meter showed a leakage of about 20 feet per hour.

The President—What is your custom in making joints, with reference to the contraction and expansion?

Mr. Stone—We use all cement. One section of main in the plant with which I am now connected is made entirely of lead joints, and I do not think there is a joint in the whole thing that does not leak more or less.

Mr. McDonald—Do you call 20 feet an hour on 2½ miles of main not very much of a leak? How much sand do you mix with the cement?

Mr. Jenkins—Twenty feet per hour is practically 15,000 per month; that makes about 72,000 per mile per year, which is a pretty fair leakage.

Mr. McDonald—It is about 180,000 feet for the 2½ miles.

Mr. Stone—That might be. I have not figured it out to that extent. I know I went over the main several times, but cannot find the leak.

The President—What sized pipe?

Mr. Stone—Part 8-inch and part 6-inch, on 3½ to 4 inches pressure.

Mr. Mayers—I would suggest if any of you propose to make cement joints that you have them tested and covered up just as soon as possible after being made, because, in the mains that I have laid, I have found by the joints standing over and having the rays of the sun strike them they would always leak, more or less. I find they should be tested just as soon as possible after being laid, and, in fact, we have gone to the trouble of placing boards over the joints to protect them from the rays of the sun.

Mr. McDonald—How do you reconcile this with that co-efficient of expansion you were telling us about?

Mr. Mayers—The sun would possibly crack cement where it would not crack cast iron.

Mr. Stone—I do not wish to take up the time of the Association, but if anyone contemplates making cement joints it would be well if he would keep the caulking far enough back so that it does not interfere with the setting of the cement. We experienced some trouble when we first attempted the making of cement joints by having the caulkers follow the pipe layers too closely, and the jar of the pipe, when the cement was not fully set, loosened the cement. We finally remedied that by keeping them some distance behind.

The Association then adjourned, to reassemble Thursday, March 17th, 1898, at 9 A.M.

[To be Concluded.]

Text of the Decision in the Case of the Welsbach Light Company vs. the Sunlight Incandescent Gas Lamp Company.

The following is the text of the decision, rendered by Judge Townsend, of the United States Circuit Court, Southern District of New York, respecting the case named in the heading—Messrs. W. F. Brown and J. R. Bennett represented the plaintiff, and Mr. Charles G. Coe stood for the defendant:

The questions herein presented at final hearing on bill and answer relate to the first claim of Patent No. 407,963, granted July 31, 1889, to Frederick Lawrence Rawson and William Stepney Rawson, for "Production of incandescent mantles," and assigned to complainant.

Prior to the discussion of the issue directly involved, it will be necessary to briefly describe the Welsbach light.

In 1885 Dr. Carl Auer von Welsbach discovered or invented the mantle of the incandescent light which bears his name. Prior to that date it was known that certain rare earths, when heated to incandescence, were possessed of great luminosity. Dr. Auer von Welsbach, or, as he will hereafter be called, Welsbach, was the first to discover that by immersing a textile fabric in a solution of the salts of said rare earths, and afterwards applying heat and consuming the fabric, the earthy salts would be left in a coherent condition exactly reproducing the fabric consumed, and capable of emitting the intense white Welsbach incandescent light. Great as was this scientific discovery it was commercially valueless. The resultant product was so light and fragile that although, as stated by the inventor, "it would remain effective as an illuminant for hundreds of hours," it would crumble to ashes if handled, or even touched by a hard body.

In their specification the patentees, after speaking of the difficulty previously found in transporting these mantles without breakage, say:

"This difficulty our invention is designed to overcome by dipping the mantles, after they have been given their proper shape, into a liquid which will thoroughly penetrate the pores of the material, and will afterwards set to such a degree of hardness as to protect the material

from danger of breakage in packing or handling, and which can afterward be removed without mechanical injury to the mantles or without leaving any objectionable residue."

The claim in suit is as follows:

"1. The herein described improvement in strengthening incandescent mantles, consisting in coating the completed mantle with paraffine or other suitable matertal, substantially as set forth."

The defenses are invalidity for lack of invention, and denial of infringement.

Bright's British patent, No. 12,305, granted in 1848, for "improvements in lamps, wicks and covers for vessels for holding oil and other fluids" *inter alia* describes a method of "manufacturing hollow cylindrical wicks in a stiffened state" to permit of their easy insertion into the lamp burner "by inserting them into paper cases * * * or by dipping them (not partially but wholly) in wax or in any other suitable suffening matter." It has not the same purpose nor mode of operation as the patent in suit, and does not anticipate it.

Gwyun patent, No. 52,788, issued in 1866, for an "Improved process for saturating wood, cloth, paper, etc., with paraffine," and Toppan patent, No. 89,095, for "Improved water-repellent material" may be considered together. The patentee, Gwynn, says that "When the paraffine is thus combined with the substances they seem together to form a new substance, inasmuch as it cannot be again expelled," and that substances thus saturated acquire "Greatly increased tenacity, toughness, power of endurance and of resistance to the action of the elements." Toppan described a similar treatment with a solution of paraffine. Each of these patents describes a process for making wood, paper and cloth waterproof, by permanently combining them with paraffine. Neither of them attempts to effect the object of the Rawson patent.

But defendant relies chiefly upon patent No. 261,529, issued July 25, 1882, to Charles Clamond, for "Means and apparatus for producing intense white light." Fig. 9 of the drawings shows a burner composed of magnesian threads. These threads are made by forcing a wet, plastic material through dies. While thus wet they are shaped into the form of a cone which is then dried and baked. The resultant product is a fragile, porcelain-like shell, or basket, of refractory material, capable of use with a gas burner to produce an incandescent light. In connection with this basket the patentee used small rods formed of the same material. It was not claimed that there was anything novel in Clamond's magnesium light which is relevant herein; but defendant contends that "This patent shows that the strengthening of such fragile, refractory cones, to protect them against breakage in transport and handling, was not new." This contention is founded upon the following statement in Clamond's specification: "The basket may be cased over with paper or other combustible material, so as to strengthen it for transport and handling, this casing being burned away when the jet is ignited."

In this chief reliance of defendant I find nothing to detract from the merit of the patented invention. There was no strengthening treatment of a refractory material having the form of a textile fabric, no combination with another substance by saturation in a protecting solution, and no process of hardening the protecting solution. In short, Clamond merely proposed to wrap up his porcelain cone in a piece of paper which would burn off when the cone was placed over a lighted flame. He protected his shell by an ordinary external wrapper, which could be removed in the ordinary way, leaving the shell as before. By the Rawson process the solution so penetrated the interstices of the Welsbach fabric that it became an integral part thereof.

But the expert and counsel for defendant claim that "All the Rawsons have done is to apply the old Gwynn process of dipping porous articles in hot, melted paraffine, or the Toppan process of dipping porous articles in paraffine solutions with a volatile hydrocarbon, such as benzine or naphtha, without any difference in their mode of application, or the result obtained therefrom, to the old purpose of protecting fragile mineral cones in transport and handling, set forth by Clamond." I cannot assent to this proposition. The Clamond protecting wrapper is not even remotely allied to the Rawson strengthening process. The result of the latter is new, distinct and strikingly unexpected. To introduce these processes in this new art, and to work out and apply the undeveloped possibilities of this use of paraffine in solution in connection with these earths, so as to place this light within the reach of the general public, was a most meritorious invention. Defendant says it does not infringe because it does not coat its mantles with paraffine or any of the equivalents mentioned in complainant's patent, and relies upon certain limitations claimed to be disclosed by the file wrapper.

After describing the use of paraffine in the specification, it is there set forth that "other materials may be employed as long as they set hard at ordinary temperatures and burn away without mechanical destruction to the mantle and without leaving any residue which would injure the light-giving properties of the mantle."

The examiner required the patentee to insert a specific statement as to what other materials are used, and the following was thereupon added:

"The materials referred to as being capable of use in lieu of paraffine may be any solid hydrocarbon of a high boiling point and many resins and gums soluble in spirit, such as alcohol, etc. Shellac will serve the same purpose, but not quite as advantageously."

The defendant insists that the patent cannot be infringed by the use of any materials other than those thus specified.

"It is admitted 'that the defendant corporation herein has * * * and still is, coating completed incandescent mantles or hoods, for the purpose of strengthening them for purposes of transport and handling, by dipping or immersing them in a solution composed chiefly of collodion, with the addition of a small percentage of castor oil, and in excess of 5 per cent.'

"That such solution is a liquid which, after the mantle or hood is coated therewith, by dipping or immersing said hood in such solution, will afterwards set at ordinary temperatures to such a degree of hardness as to strengthen the mantle or hood for the purpose of preventing breakage in transport and handling, and of such a character that it can afterwards be removed by burning away without mechanical destruction to the mantle and without leaving any residue which would injure the light-giving properties of the mantle or hood."

Complainant contends that this collodion solution is included under the words "Paraffine, or other suitable material, substantially as set forth," in the first claim, notwithstanding the enumeration of equivalents in the patent.

The invention of the patent in suit transformed the Welsbach mantle from a laboratory experiment into an article of commerce. That it has successfully overcome the obstacles previously encountered, and has accomplished results quite as important as the original Welsbach invention, is admitted. The evidence as to Welsbach's understanding of the limitations upon the practical use of his light, and the graphic illustration at the hearing herein of the bold and unique treatment of the fragile mantle, and the success of the adaptations employed in producing the desired results, indicate not only the presence of inventive genius, but claim for the invention the rank of a pioneer.

For these reasons this patent should not be narrowly interpreted, but should be so construed as to cover a broad range of equivalents.

The undisputed testimony of Dr. Chandler and President Morton shows that it was well known, at the date of this invention, that such a collodion solution would operate in the same way as a paraffine or shellac solution in the treatment of such substances, and was, therefore, an "Other suitable material." That in every other respect the defendant has appropriated the patented process, appears from his admission. While collodion is not chemically an equivalent of a hydrocarbon resin gum, and is not paraffine or shellac, it performs the same functions in the same manner and with the same result.

A patentee is not obliged, in his specification, to state all the known equivalents of the materials used by him. It is the patent as finally issued which the Court is to construe, and upon which the patentee must stand. In this case the patentees have claimed "paraffine or other suitable material, substantially as set forth." They have set forth that "Other materials may be employed as long as they set hard at ordinary temperatures and burn away without mechanical destruction to the mantle." The defendant uses a suitable material known at the date of the invention to have all these properties and characteristics, and has thereby appropriated complainant's product.

Let a decree be entered for an injunction, and an accounting.

Calcium Carbide and Acetylene.

Engineering reports that at an ordinary meeting of the Institution of Civil Engineers (England), held March 15, Mr. Henry Fowler, Assoc. Mem. Inst. C.E., read a paper on the subject named in the heading. The author said:

Acetylene was first isolated by E. Davy in 1837 from potassium carbide, a bye product of Sir H. Davy's method of manufacturing potassium. In the middle of the century Berthelot investigated its properties, and Wöhler produced it from calcium carbide. During the past few years it had assumed commercial importance owing to the development of the electric furnace, in which calcium carbide could be

readily produced from lime and carbide. The furnaces used consisted essentially of crucibles with carbon rods forming the positive electrode and a bottom plate lined with carbon for the negative. In the more recent furnaces these crucibles were mounted on small trolleys so that they might be run out of the furnace when ready and a fresh one inserted without loss of time. The carbide formed was a hard dense substance of reddish color, unacted upon by most of the ordinary reagents. It was, however, rapidly decomposed by water into acetylene and lime, giving 5.9 cubic feet of acetylene, at a temperature of 60° F. and a pressure of 30 inches of mercury, per 1 pound of carbide. As the power required theoretically to produce 1 pound of calcium carbide in an electric furnace was more than 2 horse power hours, its manufacture was at present restricted to localities where power was cheap, as, for instance, where water power was available.

Acetylene was a colorless gas with an intensely penetrating odor, and was slightly soluble in water, and extremely so in some other fluids. It was endothermic, giving 407 calories per cubic foot, whereas theoretically its value was 336.5 calories. As an illuminant it gave the most brilliant light of all gases, 5 cubic feet per hour, under suitable conditions, giving 240 candle power. For small consumptions, however, this value was not obtained, and ordinary burners, after a short time became clogged with soot. The latter defect could be overcome by the use of an injector burner, which, however, required a higher pressure. Various diluents had been suggested, but had not been tried on a practical scale. The flame had a high actinic value, and caused light colors to appear lighter, and dark colors darker than when exposed to sunlight. The gas, when inhaled, combined with the hæmoglobin and rendered the blood incapable of taking up oxygen, and thus caused suffocation. It had, however, been shown that it was no more dangerous in this respect than coal gas.

Acetylene united with copper, in the presence of moisture and ammonia, formed copper acetylide, and this, when in a dry state, was violently explosive. Silver was similarly acted upon.

Owing to the difficulty of obtaining the materials used in producing calcium carbide in a pure state, phosphoreted and sulphureted hydrogen and ammonia were often found in the gas, and these should be removed by passing the gas through water and an acidified solution of a metallic salt. Nearly all proportions of air and acetylene were explosive, the gas itself being decomposed at 780° C. At higher pressures than two atmospheres, if this temperature was attained by a part of the gas, it was communicated throughout the whole mass, and a violent explosion occurred, which caused the pressure to rise to 11 times the initial pressure; but owing to cooling by radiation, etc., this was not reached in practice. Acetylene could be readily liquefied, having a critical temperature of 37° C. and a pressure of 68 atmospheres. The resulting liquid was very light, and had a high coefficient of expansion. Although this was a convenient method of storing a large quantity of gas in small bulk, it was unsafe, because of the ease and violence with which it exploded. The gas was extremely soluble in acetone; it had been suggested that this property might be used for its storage, but it had been shown that acetylene did not, even when thus dissolved, lose all its explosive properties.

Numberless devices for generating acetylene had been invented; its application, however, was more dependent upon its cost than upon the apparatus used in its manufacture. With calcium carbide at £16 per ton, it could compete with coal gas at 2s. 6d. per 1,000 cubic feet, when flat flames were used for the latter, and a light of less than 30 candles was required. This rendered it peculiarly suited for buildings in which coal gas was not obtainable. It has been used for lighting a station on the Great Southern and Western Railway of Ireland, and at the Salford Docks of the Manchester Ship Canal. In the latter case, special portable generators were used which could be carried to any part of the docks and might be placed on the quay side and the gas led away to lamps placed in the holds of vessels.

Amongst many other uses suggested were the lighting of lighthouses, lightships, buoys, military signals, etc., as a standard of light, etc. Its price prevented its use for gas engine driving. This reason also prohibited its use as an enricher of coal gas, as it did not with low percentages give an increase of above 1 candle power for 1 per cent. of acetylene. With "blue" water gas it was even less applicable, as more than 10 per cent. was required before any illumination was obtained. Methane and nitrogen were claimed to carry the gas without affecting its illuminating power.

For lighting railway carriages, where the gas was carried under pressure in reservoirs, it was essential, to prevent too frequent recharging, that the gas should have a high illuminating power. In addition to possessing this qualification, acetylene did not liquefy until 21.5 atmospheres at 0° C., whereas oil gas lost valuable hydrocarbons, which were condensible at pressures below 9 atmospheres, the usual pressure to which oil gas for use in carriage reservoirs was at first subjected. The loss of these illuminating agents reduced the candle power to about 40 candles. Acetylene met with the same difficulty in the case of carriage lighting as in others, namely, that so powerful a light was not needed as would give the best illuminating value for the gas. Tables were given to show that although acetylene had a nominal candle power of 240 per 5 cubic feet per hour burnt, and oil gas had only 40-candle power, or as 6 to 1, yet for a consumption of 1 cubic foot per hour, the highest value of acetylene was a little over 200 candles, or 40 candles per cubic foot per hour, whilst oil gas gave 8 candles, and the ratio became 5 to 1. If this could be maintained, acetylene manufactured from calcium carbide at £16 per ton would be cheaper per unit of light than oil gas, although the cost would be 0.103d. per burner hour for oil gas against 0.396d. per burner hour for acetylene. A light of 40 candles was not, however, required in a single compartment, which, in fact, would, even with the tendency to demand better lighting, be brilliantly lit with 20 candles. To obtain this lighting with acetylene would require a consumption of 0.585 cubic foot, costing 0.231d. per burner hour, whilst it could be obtained with oil gas burnt in a regenerative lamp burning 1.464 cubic foot per hour for 0.1507d. per hour. Assuming that two reservoirs, each of 10 cubic feet capacity, were placed under a five-compartment carriage, and charged to 105 pounds per square inch above atmospheric pressure, the reservoirs would require recharging in 47.8 hours if acetylene were used, as against 19.2 hours with oil gas.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

Mr. James M. Hadden has been appointed Manager of the Poughkeepsie (N. Y.) gas works, succeeding the late Mr. John Tracy.

The proprietors of the Lockport (N. Y.) Gas and Electric Light Company have awarded the contract for a new storage holder to the Riter-Conley Company. The holder is to be of the double-lift order, is to rest in a steel tank, and will have 12 inch connections. Its capacity is rated to 150,000 cubic feet.

Last week we reported that Mr. John H. Finn had resigned from the service of the Minneapolis (Minn.) Gas Light Company to accept the position of General Manager of the New England Gas and Coke Company. In the main the item was right, but Mr. Finn's actual signature is George H. Finn. He assumes his new duties on the 15th inst.

The following inquiry is submitted to our readers. We shall be pleased to publish in our columns any replies that may be made thereto:

To the Editors American Gas Light Journal: We are appreciative readers of your Journal and think it is possible that, as Editors of other papers say, you stand in the capacity of adviser-general to all gas companies, you can tell us of some method of applying an atmospheric flame directly in the tubes of a horizontal boiler—*i. e.*, so that the flame would be drawn into the tube for at least half its length (say 3 feet) by the draft from the fire box in the same way that the flame is drawn from the fire in the grate bars. We inclose you the only available cut of the boiler in question, giving dimensions, etc., with the idea, if such a thing is possible, of getting statistics for the flow of gas, the size of the orifice, etc. The engineer in charge thought it possible to work some such scheme as this by capping the ends of the tubes, drilling an orifice in the caps, and attaching some sort of atmospheric burner which, with the draft, would shoot the flame at least part way through the boiler tubes. If you have any idea that such a thing would be successful, or if you have any information of such application of gas to boiler tubes, we would be exceedingly thankful. Yours very truly, L. J. C.

Our correspondent incloses us cut and description of the Kewanee firebox boilers, for brick setting without dome, as manufactured by the Kewanee (Ills.) Boiler Company; and presume that he refers to No. 8 of the Boiler Company's catalogue, the dimensions of which are: Diameter of shell, 42 inches; length over all, 10 feet; number of tubes, 52; diameter of tubes, 2½ inches; length of tubes, 73 inches; length of firebox, 44 inches; width of firebox, 36 inches; height of firebox, 41 inches; thickness of shell, ¼ inch.

Mr. J. C. Ross, formerly in charge of the works at Perth Amboy, N. J., has accepted the position of Superintendent of the American Gas Company's recently acquired plant, which bears the distinctive title of the Westchester (N. Y.) Gas and Electric Company. The district covered by it is that originally occupied by the Rye and Port Chester Company.

The Riter-Conley Company's contract with the New Bedford (Mass.) Gas and Edison Light Company, mention of which award was made by us last week, calls for the construction of a triple-lift holder, in steel tank, with a rated capacity of 1,000,000 cubic feet.

THE personnel of the new Board of Directors of the Detroit City Gas Company is as follows: Emerson McMillin, W. T. Douthirt, C. T. Scoville, C. P. Huntington, T. W. Hubbard, John Byrne and Frank S. Smith, of New York; and M. W. O'Brien, John C. Donnelly, D. M. Ferry, E. T. Lynch, W. H. Wells and W. C. McMillan of Detroit.

CONSIDERABLE damage was occasioned on March 24th to the plant of the Craig-Reynolds foundry, North Dayton, Ohio, through an explosion of acetylene gas.

THE franchise of the Houston (Texas) Gas Company has been extended for a period of 30 years. Under its provisions the Company agrees to sell gas at a net minimum rate of $1.80 per 1,000.

AT the annual meeting of the Winnipeseogee Gas and Electric Company, of Laconia, N. H., the officers chosen were: Directors, C. A. Busiel, A. G. Folsom, Jno. T. Busiel, S. B. Smith, H. J. Odell, Edwin F. Burleigh and C. L. Pulsifer; President, Charles A. Busiel; Clerk and Treasurer, N. J. Edgerly.

IT is reported again that a gas works will be constructed at Princeton, Ind. Mr. R. P. Moore is said to be the principal one in interest.

WE understand that control in the Somerset Lighting Company, of Somerville, N. J.. has been purchased by Mr. A. M. Young, who it is claimed represents certain important gas interests having headquarters in Newark, N. J.

THE Legislature of Virginia, at its last session, enacted the following measure, which explains itself:

"Chapter 229.—An act to protect electric lighting and power companies, and gas companies and cities and towns from the theft of electric current or gas, or apparatus, or unlawful interference therewith.

"1. Be it enacted by the General Assembly of Virginia that any person who shall unlawfully injure or destroy, or having the right to prevent it shall permit to be injured or destroyed, any meter, pipe, conduit, wire, line post, lamp or other apparatus belonging to a city or town, or to a company engaged in the manufacture or sale of electricity or gas for lighting or power purposes, or who shall unlawfully prevent an electric or gas meter from duly registering the quantity of electricity or gas supplied, or in any way unlawfully interfere with its proper action or registration, or who shall, without the consent of such company, city or town, unlawfully divert any electric current from any wire of such company, city or town, or who shall otherwise unlawfully use or cause to be used, without the consent of such company, city or town, shall, on conviction thereof, be deemed guilty of a misdemeanor, and be punished by a fine of not less than $25 nor more than $200, or by confinement in jail for not more than one year, or by both such fine and imprisonment.

"2. This act shall be in force from its passage."

THE following is the text of an ordinance, enacted last month by the authorities of Atlanta, Ga., which measure is locally known as the "electrolysis ordinance:"

"Be it ordained by the Mayor and General Council of the city of Atlanta, and it is hereby ordained by authority of the same:

"Section 1. That it shall be the duty of all persons or companies using or employing electrical currents in the city of Atlanta, by or before July 1, 1898, to provide and put in use such means and appliances as will so control and effectually retain such currents in their proper channels and on their own tracks and other works as to prevent injury to pipes and other structures belonging to the city of Atlanta, in the streets, alleys or other parts of said city. And to repair and renew said means and appliances, or from time to time change and improve the same as may be necessary to accomplish said purpose. All at his or their charges and expense and at his or their own risk, selecting and adopting such means and apparatus as shall prevent injury to pipes and other structures belonging to said city as aforesaid.

"Sec. 2. Any person or company violating this ordinance shall be subject to a fine of $100 for each offense, and in order to secure a conviction under this ordinance it shall not be necessary to show that the entire electrical current imposed on the pipes or other structures belonging to said city, in the streets, alleys or other parts thereof, escapes from or comes from the power house or works of the parties aforesaid. But, it shall be sufficient for a conviction if the company or party, by failing to restrain its or their currents, materially contributes to the injury of pipes or other structures belonging to said city as aforesaid.

"Sec. 3. Be it further ordained by the authority aforesaid, that neither the collection of any penalty for violation of Section 1 of this ordinance, nor any prosecution for the same shall have the effect to take away or abridge the right of said city to damages arising from the trespass done to said city, or to the pipes or other structures belonging to said city by such aforesaid currents being permitted to escape from the structures of the party or parties generating the said current or currents, and in case of damage to the pipes or other structures belonging to the said city, in the streets, alleys or other parts thereof, the same may be demanded and collected through the proper channels, and on failure to pay, that the same may be sued for in any Court having jurisdiction; provided, this is not to be construed as requiring the city to show the damage actually produced by said current.

"Sec. 4. Be it further ordained by the authority aforesaid that all ordinances and parts of ordinances in conflict with this ordinance be, and they are hereby, repealed."

MR. JAS. DUNCAN has been appointed Receiver of the properties of the Alton (Ills.) Railway and Illuminating Company. Mr. Duncan was required to file a bond in $10,000.

RECENT advices from East St. Louis, Ills., are to the effect that Messrs. Jno. B. O'Mara, J. T. Donovan, F. R. Sessions, H. Cornet and J. M. Sellers, have petitioned the authorities for an ordinance permitting them to operate an opposition gas works in East St. Louis. The scheme proposes a Company capitalized in $200,000, the selling rates to be $1.50 per 1,000 for an illuminating use, and $1 per 1,000 for a fuel supply.

ABOUT a fortnight ago Mr. W. C. Goldsmith, late Assistant Secretary of the Detroit Gas Company, was the guest of honor at a dinner given in the Hotel Cadillac, Detroit. Covers were laid for 24, and a very enjoyable time was had. As before stated in the JOURNAL, Mr. Goldsmith goes to Benton Harbor, Mich., to manage the affairs of the Benton Harbor Company, in which concern he owns a substantial interest.

ON the evening of March 26th, Mr. John F. Walsh, night superintendent of Station B, Laclede Gas Light Company, of St. Louis, Mo., was presented with a handsome watch and locket, by the workmen of the Company, as a testimonial recognizing his heroism in risking his life to rescue the four children of the Comer family, during the fire that destroyed the Comer domicile on the afternoon of March 9th. Col. Edward Devoy, who acted as spokesman for the men, in making the presentation said: "John, your fellow workmen and associates, who have always recognized in your character the qualities of true manhood, are here this evening to testify to their admiration of a deed in which you have shown something even higher than they had known, and which few men have been able to display. I refer to your heroic deed of March 9th, by which, at the risk of your own life, you attempted to save the lives of four helpless children. It matters not that three of them died, having been too badly burned to recover. Their death but emphasizes the peril which you encountered in the effort to save them. It is a great pleasure to me, in behalf of these men, to present to you this testimonial of their esteem and affection, and to wish you from them a long life of prosperity for you and your family." On receiving the gifts Mr. Walsh exhibited beyond doubt a greater degree of perturbation than that which affected him when engaged in the rescuing of the Comer children, but he finally managed to acknowledge the testimonial through these words: "Col. Devoy: It is impossible for me to speak the gratitude and pleasure I feel at your words and this gift from my friends—they bring me so vividly back to the hour when I saw those poor children suffer. I feel though that one must be less than a man to have done less than I did. It was no more than any of my friends would have done in my place. I thank you all for the kind wishes and return them from my heart." At the conclusion of the acceptance, Superintendent Chollar wanted to know "What's the matter with John Walsh?" and the willing and lusty answer from the hundred or more men present was, "He's all right." The inner case of the watch carries the inscription, "Presented to John F. Walsh for his bravery in rescuing four children from a burning building, March 9, 1898."

MR. TRUMAN B. WELCH, Superintendent of the Duluth (Minn.) Gas and Water Company, died suddenly on the night of March 21st. He was in his 36th year.

MR. GEORGE HENRY REINOEHL, for many years President of the Lebanon (Pa.) Gas Company, died at his home in Lebanon, on the morning of March 23d. Deceased, who was in his 64th year, had been prominent in the religious, social, financial and mercantile life of Lebanon and its remote environs since 1856. His wife and six children survive.

THE controversy between the authorities of Covington, Ky., and the proprietors of the Covington Gas Company, respecting the right of the former to absorb or otherwise dispose of the latter's properties, is to be settled by a court of five arbitrators.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, APRIL 4, 1898.

The Market for Gas Securities.

The market readily responds to rumors regarding the relations of our country to Spain, and the professional speculators have things pretty much their own way. Since time of last writing Consolidated sold down to 167 and up to 185, the quoted price at 2 P.M. to-day (Friday) being 177 to 177½. As was said by us some weeks ago would be the case, the Legislature adjourned without action on the proposition to alter the gas rates, but it did pass one measure that will be of much use in aiding the consolidation of the city's gas interests, which is much nearer to finality than the average investor in gas shares imagines. Gas shares in general are higher than was the case a week ago, the most notable rise having been experienced in the instance of Standard common.

Brooklyn Union is 113 to 114; Peoples, of Chicago, is 93 to 93½; and Consolidated of Baltimore is 59 to 59¾. Our advice is to buy anything on the list, particularly Consolidated and Mutual, of New York, Brooklyn Union and Standard, of New York.

Gas Stocks.

Quotations by Cochran & Close, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

APRIL 4.

☞ All communications will receive particular attention

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$36,230,000	100	177	177½
Central	500,000	50		..
" Scrip	220,000	..	100	.
Cental Union, Bonds, 5's	3,000,000	1,000	99½	100
Equitable	4,000,000	100	217	225
Bonds, 6's	1,000,000	1,000	105	..
" 1st Con. 5's	2,300,000	1,000	114	.
Metropolitan Bonds	658,000	..	108	112
Mutual	,500,000	100	320	325
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	.	..	
New Amsterdam Gas Co.	13,000,000	100	28½	29½
Preferred	10,000,000	100	64	65
Bonds, 5's	11,000,000	1,000	99	101
Northern	150,000	50		
" Bonds	150,000	1,000	..	
Northern Union, Bonds, 5's	1,250,000	1,000	94½	95½
New York and East River	5,000,000	100	81	83
Preferred	2,000,000	100	112	115
Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	102	105
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	135	140
Preferred	5,000,000	100	150	160
Bonds, 1st Mortgage, 5's	1,500,000	1,000	114	115
Yonkers	299,650	50	180	.
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	109½	110½
" " Bonds (5's)	15 000,000	1,000	..	112
Bay State	50,000,000	50	2¾	3
" Income Bonds	2,000,000	1,000	..	75
Boston United Gas Co.—				
1s Series S. F. Trust	7,000,000	1,000	89	90
2d " " "	3,000,000	1,000	..	70
Buffalo City Gas Co.	7,000,000	100	25	27
" " Bonds, 5's	7,000,000	1,000	89	91
Central, San Francisco	2,000,000	..	95	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,069,000	.	89	91
1st Mortgage	1,085,000	..	101	103½
Consumers, Jersey City	2,000,000	100	75	80
" Bonds	600,000	1,000	102½	105
Cincinnati G. & C. Co.	8,500,000	100	200	201
Consumers, Toronto	1,600,000	50	184½	187
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	.	..
Consolidated, Baltimore	11,000,000	100	59⅛	59¾
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490,000	..	..	..
Consolidated G. & E. Co.'s, Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit	4,000,000		59	60
" Con. Bonds	4,312,000	..	95	96
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	78	81
" Bonds	2,000,000	..	89	91
Hartford	750,000	25	..	145
Indianapolis	2,000,000	..	115	125
" Bonds, 6's	2 650,000	..	106	107
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	78	83
Bonds	1,000,000	1,000	90	91
Louisville	2,570,000	50	..	..
Laclede, St. Louis	7,500,000	100	41	42
Preferred	2,500,000	100	88	88
Bonds	9,034,400	1,000	100	101
Montreal, Canada	2,000,000	100	200	.
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	252	..
Oakland, Cal.	2,000,000	..	53½	54
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	93	93½
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	..	108
2d "	2,500,000	1,000	104	105

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	563
Fred. Bredel, Milwaukee, Wis.	548
Geo. R. Rowland, New York City	563
The Western Gas Construction Co., Fort Wayne, Ind.	550
Humphreys & Glasgow, New York City	554
American Gas Co., Phila., Pa.	548
David Leavitt Hough, New York City	565
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	563

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	561
United Gas Improvement Co., Phila., Pa.	553
Burdett Loomis, Hartford, Conn.	562
National Gas and Water Co., Chicago, Ills.	555
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	563
The Western Gas Construction Co., Fort Wayne, Ind.	550
Humphreys & Glasgow, New York City	554

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City	564
Continental Iron Works, Brooklyn, N. Y.	562
Deily & Fowler, Phila., Pa.	564
Kerr Murray Mfg. Co., Fort Wayne, Ind	560
Stacey Mfg. Co., Cincinnati, Ohio	563
Bartlett, Hayward & Co., Baltimore, Md.	561
Davis and Farnum Mfg. Co., Waltham, Mass.	560
R. D. Wood & Co., Phila., Pa.	562
Isbell-Porter Company, New York City	562
Fred. Bredel, Milwaukee, Wis.	548
United Gas Improvement Co., Phila., Pa.	553
Berlin Iron Bridge Co., East Berlin, Conn.	546
National Gas and Water Co., Chicago, Ills.	555
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	563
The Western Gas Construction Co., Fort Wayne, Ind.	550
Humphreys & Glasgow, New York City	554
Gas Engineering Co., Pittsburgh, Pa.	560
American Gas Co., Phila., Pa.	548
Logan Iron Works, Brooklyn, N. Y.	564
Riter-Conley Co., Pittsburgh, Pa.	554

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City	563
R. D. Wood & Co., Phila., Pa.	562
James R. Floyd's Sons, New York City	564
Continental Iron Works, Brooklyn, N. Y.	562
Gas Engineering Co., Pittsburgh, Pa.	560
Logan Iron Works, Brooklyn, N. Y.	564
Riter-Conley Co., Pittsburgh, Pa.	554

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md.	561
Fred. Bredel, Milwaukee, Wis.	548
J. H. Gautier & Co., Jersey City, N. J.	558
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.	558
Adam Weber New York City	558

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City	563
R. D. Wood & Co., Phila., Pa.	562

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich.	545
G. Shepard Page's Sons, New York City	563
Gas Engineering Co., Pittsburgh, Pa.	560

GAS METERS.

John J. Griffin & Co., Phila., Pa.	563
American Meter Co., New York and Philadelphia	567
Helme & McIlhenny, Phila., Pa.	567
D. McDonald & Co., Albany, N.Y.	565
Nathaniel Tufts Meter Co., Boston, Mass.	566
Maryland Meter and Mfg. Co., Baltimore, Md.	566
Metric Metal Co., Erie, Pa	566
Keystone Meter Co., Royersford, Pa.	566
Detroit Meter Company, Detroit, Mich.	567

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia	567
John J. Griffin & Co., Phila., Pa.	563
D. McDonald & Co., Albany, N. Y.	565
Helme & McIlhenny, Phila., Pa.	567

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio	565
M. J. Drummond, New York City	565
R. D. Wood & Co., Phila., Pa.	562
Warren Foundry and Machine Co., New York City	565
Donaldson Iron Co., Emaus, Pa.	565
Utica Pipe Foundry Co., Utica, N. Y.	565

PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass	546

PIPE DRILLING & TAPPING MACHINES.

George Light, Dayton, Ohio	545

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y.	555

GAS COALS.

Penn Gas Coal Co., Phila., Pa.	557
Perkins & Co., New York City	556
Despard Gas Coal Co., Baltimore, Md.	557
Westmoreland Coal Co., Phila., Pa.	557
Berwind-White Coal Mining Co., New York and Phila.	556
W. D. Althouse & Co., Phila., Pa.	557

CANNEL COALS.

Perkins & Co., New York City	556
W. D. Althouse & Co., Phila., Pa.	557

GAS ENRICHERS.

Standard Oil Co., New York City	557
The Sun Oil Co., Pittsburgh, Pa.	557

COKE CRUSHER.

C. M. Keller, Columbus, Ind.	557

GAS GAUGES.

The Bristol Co., Waterbury, Conn.	559

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City	555
Isbell-Porter Co., New York City	562
The Wilder Mfg. Co., Phila., Pa.	546
R. D. Wood & Co., Phila., Pa.	562
Wm. M. Crane & Co., New York City	546

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City	562
Continental Iron Works, Brooklyn, N.Y.	562
G. Shepard Page's Sons, New York City	563
Logan Iron Works, Brooklyn, N. Y.	564
R. D. Wood & Co., Phila., Pa.	562

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N.Y.	558

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J.	558
B. Kreischer & Sons, New York City	558
Adam Weber, New York City	558
Laclede Firebrick Mfg. Co., St. Louis, Mo.	558
Cyrus Borgner, Phila., Pa.	558
James Gardner, Jr., Pittsburgh, Pa.	558
Henry Maurer & Son, New York City	558
Baltimore Retort and Firebrick Co., Baltimore, Md.	558
Parker-Russell Mining and Mfg. Co., St. Louis, Mo.	558
Brooklyn Firebrick Works, Brooklyn, N. Y.	558
F. Behrend, New York City	559

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa.	552
Victor Incandescent Company, New York City	546

MICA GOODS.

The Mica Mfg. Co., New York City	550

BURNERS.
C. A. Gefrorer, Phila., Pa..... 562
Wm. M. Crane & Co., New York City..... 546

LAVA GAS TIPS.
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 545

STREET LAMPS.
Welsbach Street Lighting Co., New York and Phila..... 554

PURIFYING MATERIALS.
Connelly Iron Sponge and Governor Co., New York City 555
Greenpoint Chemical Works, Brooklyn, N.Y..... 559
Henry W. Douglas, Ann Arbor, Mich 555
Gas Purification and Chemical Co., Ltd., London..... 555

EXHAUSTERS.
The P. H. & F. M. Roots Co., Connersville, Ind..... 549
Isbell-Porter Company, New York City..... 562
Connelly Iron Sponge and Governor Co., New York City 555

VALVES.
Ludlow Valve Manufacturing Co., Troy, N. Y. 550
Chapman Valve Manufacturing Co., Boston, Mass..... 550
R. D. Wood & Co., Phila., Pa..... 562
Continental Iron Works, Brooklyn, N. Y..... 562
The P. H. & F. M. Roots Co., Connersville, Ind..... 549
Isbell-Porter Co., New York City..... 562
The Western Gas Construction Co., Fort Wayne Ind.... 550

ELECTRICAL APPARATUS.
Wm. Henry White, New York City 563

GAS ENGINES.
Otto Gas Engine Works, Phila., Pa..... 528
Backus Water Motor Co., Newark, N. J..... 508

ENGINES AND BOILERS.
The Hazelton Boiler Company, New York City..... 546
W. G. & G. Greenfield, East Newark, N. J..... 508

PURIFIER SCREENS.
John Cabot, New York City..... 559

GAS STOVES.
American Meter Co., New York and Philadelphia 551
Maryland Meter and Manufacturing Co., Baltimore, Md. 566
Keystone Meter Co., Royersford, Pa..... 566
Wm. M. Crane & Co., New York City..... 546
The Standard Lighting Co., Cleveland, Ohio..... 507
The Schneider & Trenkamp Co., Cleveland, Ohio..... 547
George M. Clark & Co., Chicago, Ills..... 547
Detroit Stove Works, Detroit, Mich..... 505

GASHOLDER TANKS.
J. P. Whittier, Brooklyn, N. Y..... 550

GASHOLDERS.
Bartlett, Hayward & Co., Baltimore, Md..... 561
Continental Iron Works, Brooklyn, N. Y..... 562
Deily & Fowler, Philadelphia, Pa..... 564
Davis & Farnum Mfg. Co., Waltham, Mass..... 560
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 560
Stacey Mfg. Co., Cincinnati, Ohio..... 563
R. D. Wood & Co., Philadelphia, Pa..... 562
Logan Iron Works, Brooklyn, N. Y..... 564
Riter-Conley Co., Pittsburgh, Pa..... 554

GAS SECURITIES.
Marquand & Parmly, New York City..... 550

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO., 813 DREXEL BUILDING, PHILA., March 25, 1898.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable on April 15, 1898, to stockholders of record at the close of business March 31, 1898. Checks will be mailed.

1191-2 EDWARD C. LEE, Treasurer.

WANTED,

A Superintendent for a Gas Company in a Small City.

Man with knowledge of manufacture of coal gas and distribution. Address, stating salary expected,

1191-1 "T. M. J.," care this Journal.

Wanted to Purchase,

A GAS WORKS.

I will buy a gas works in a town of 5,000 to 20,000 inhabitants, and will pay a liberal commission to be put in communication with selling stockholders. All communications strictly confidential. A. M. SUTHERLAND,

1191-2 231 Broadway, New York City.

Position Wanted

by a man of ability,

As Assistant Superintendent of a Large Gas Works.

Can furnish best of references. Address "ABILITY,"

1191-2 Care this Journal.

ENGAGEMENT DESIRED

As Superintendent of a Gas or Gas and Electric Plant,

By a young man who is thoroughly familiar with all the details of manufacture and distribution. Expert in the handling of Lowe apparatus. Address

1190-tf "A. B.," care this Journal.

SUPERINTENDENT.

An active man wants the management of a gas property. Would be willing to work under an older man in a city of over 30,000,000 output. A close manager, especially expert in the handling of Lowe water gas machinery. Member of the American Gas Light Association.

1184-tf "F. J.," care this Journal.

CALIFORNIA GAS INVESTMENT.

The undersigned will be pleased to hear from parties desiring to invest, or engage personally, in the gas business in one of the most rapidly growing cities in Southern California. The Company owns its own supply of gas-making materials, whereby larger profits are assured than can be made in any other locality in the United States. Address for particulars T. S. C. LOWE,

1176-tf Passadena, Cal.

AN EXPERIENCED GAS ENGINEER AND CHEMIST

is open to accept immediate engagement; charge of works, or on the road. Experience in working inclined retorts. First-class references and testimonials. Address

1178-tf "M. R. S.," care this Journal.

SALE OF GAS and ELECTRIC LIGHT PLANT.

The undersigned, as Receiver, will, on Tuesday, the 31st day of May, A.D. 1898, at the north door of the Court House, in Girard, Crawford County, Kansas, offer for sale to the highest bidder for cash at time of sale, the gas and electric light plants of the Pittsburg Gas Light and Coke Company, of Pittsburg, Kansas, which comprises one-half block in the center of the city, with the improvements and machinery thereon, and the gas and electric light systems of the city of Pittsburg. The Pittsburg Gas Light and Coke Company is a Kansas corporation with a capital stock of $100,000. The property will be sold subject to outstanding bonds in the sum of $52,500, and for not less than sufficient to pay outstanding Receiver's certificates and expenses, and costs, which at the time of sale will approximate $13,000. The gross yearly income from the plants averaged $19,000 for the past two years, and improvements to the amount of $10,000 have been added to the property during that time. The Gas Company has a lighting contract with the city that has yet 10 years to run, that pays about $5,000 per year. Pittsburg, Kansas, in March, 1897, had a population of over 12,000. It has since increased. It is in the center of the coal and zinc region of Southeastern Kansas, and is the most progressive and thrifty city in the State. During the year ending March, 1897, the population increased upward of 2,000. The property is desirable for any one seeking that kind of investment. For further particulars address the undersigned,

J. N. HODGES, Receiver,

1191-8t Pittsburg, Kansas.

For Sale.

A Small Gas and Electric Light Plant,

in a Southern city of 3,800 inhabitants.

Address FORT WAYNE ELECTRIC CORPORATION,

1097-tf Fort Wayne, Ind.

FOR SALE,

at a bargain,

Two 50-H.P. Otto Gas Engines,

in first-class condition.

Address WOONSOCKET GAS CO.,

1175-tf Woonsocket, R. I.

FOR SALE.

Hydraulic, Dip, Branch and Ascension Pipes, Mouthpieces and Lids, for four Benches of 5's and for one Bench of 3 retorts.

Two Coolers, or Air Condensers, each of 150'000 cubic feet capacity.

Multitubular Condenser, shell, 36 in. diameter, with 98 2-in. tubes, 10 ft. 6 in. long.

D-Shaped Tar Extractor, 8 ft. long, 1 ft. 6 in. deep.

Scrubber, 48 in. diameter, 11 ft. 9 in. high. Three man holes, 11 in. by 15 in.

S-inch Center Seal. Four Purifiers, 8 ft. x 6 ft.

KEY CITY GAS CO

1119-tf Dubuque, Iowa.

Utilize Your Gas Liquor.

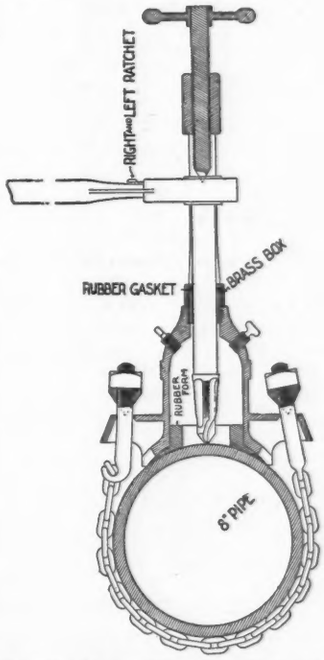
NO EXTRA LABOR OR OPERATING EXPENSES.

Ammonia Concentrator.

Not Expensive. Write to

STROH & OSIUS, Pat'ees, or Mich. Ammonia Works, Detroit, Mich.

Dayton Tapping Machine.



This Machine will drill and tap ¾-inch to 2 inch holes in 2-inch to 36-inch pipe, without any escape of gas. Shipped on 30 days' trial to any Gas Company. Manufactured by

GEO. LIGHT, Dayton, Ohio.

ABRAHAM LINCOLN

Said, that, "When an American bought steel from an ENGLISH manufacturer, America had the steel and England had the money; but when he bought steel from an American manufacturer America had both the steel and the money." This is true, and works equally well on Gas Tips and Burners. There is *no* reason why you should buy Foreign-made Gas Tips or Gas Burners.

STEWARD'S Special Burner

Is now in use by *the largest* Gas Companies in the U. S. They are giving satisfaction wherever used. Buy from us, keep your money at home and get the best goods on the market.

We are very fond of sending samples to Gas Companies.

They have a LAVA Tip.

THE D. M. STEWARD MFG. CO.,

CHATTANOOGA, TENN.

From All Points of the Compass

We are getting inquiries for

GAS APPLIANCES,

Because we carry the largest assortment of goods pertaining to the use of gas in the World.

Our new Catalogue will be mailed on application, and contains a complete assortment of Appliances for Cooking and Manufacturing Purposes. If not on file send for new copy, No. 13.

BRAY'S BURNERS

Are the reliable sort that every Gas Company can recommend for general use. Every Burner is stamped with Name and Trade Mark, which is a guarantee of quality by the Largest Burner Factory in the World.

William M. Crane & Co.,

OFFICE, 838 Broadway,

FACTORY, 447 to 453 West Fourteenth Street, New York City.

"VICTOR" Regenerative Incandescent Gas Lamps and Mantles

No Air Shutter, therefore no Smoked Mantles. Hot Air taken from Chimney. Impossible to snap back. "VICTOR" MANTLES are the strongest and most durable on the Market.

Address for full particulars and Illustrated Catalogue,

VICTOR INCANDESCENT CO., 171-173 6th Ave., N.Y. City.

THE GREATEST IMPROVEMENT IN GAS LIGHTING

Has been made by

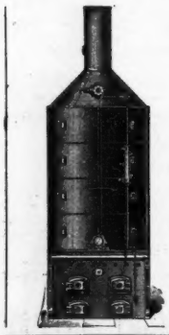
WILDER'S VOLUMETRIC GOVERNORS.

They control the pressure at the burner, and deliver the quantity for which they are set regardless of high or low pressure in the supply.

WELSBACH LIGHTS are fully controlled, and the governors soon pay for themselves by preventing the breaking of mantles and chimneys. Thousands are already in use. Orders may be given to the Welsbach Co., or sent to ourselves.

THE WILDER MANFG. CO., - - 818 Cherry St., PHILADELPHIA.

HIGH-PRESSURE WATER-TUBE BOILERS



EQUIPPED WITH

SQUARE FURNACE, SQUARE GRATE SURFACE, STEEL JACKET, LINED WITH BRICK.

Single Boilers or Compact Batteries.

GREAT SAVING OF FUEL AND FLOOR SPACE.

A HIGH-CLASS BOILER WITH AN UNEQUALED RECORD.

Send for our New Book, "The Generation of Power."

The HAZELTON BOILER COMPANY,

Sole Proprietors and Manufacturers,

Builders of Stacks, Tanks and Miscellaneous Metal Work.

Cable Address, "Palla," New York, Tele., "1229—18th St." New York. **Gen'l Office, 716 E. 13th St., N.Y., U.S.A**

THE ANDERSON Patent Cutter Carrying Link

Made in all sizes.

Will cut from 2 in. to 24 in.

Pipe Cutting Tool

For Cutting Cast, Wrought Iron, Gas & Water Pipes.

THE ANDERSON PIPE CUTTER COMPANY, Manufacturers,
163 Liverpool st., E. Boston, Mass
N. Y. Office, 135 Greenwich St
C. H. TUCKER, JR., Manager.

WALDO BROS.,
102 Milk Street, Boston, Mass.

BRIDGES BERLIN BUILDINGS

OUR CATALOGUE

OF THREE HUNDRED PAGES ILLUSTRATING AND DESCRIBING A LARGE NUMBER OF

BRIDGES
BUILDINGS
AND ROOFS

Designed and Built by us

Is now ready and will be sent on application.

THE BERLIN IRON BRIDGE CO.

EAST BERLIN, CONN.

WE respectfully solicit correspondence from every Gas Company interested in the sale of Gas Ranges, Hot Plates, etc., for the season of 1898. . . .

Our lines are complete, and we guarantee prompt service.

LET US FIGURE WITH YOU.

THE Schneider & Trenkamp Co.,

CLEVELAND, O. CHICAGO, ILL.

8 New Gas Ranges

DESCRIBED IN

OUR NEW CATALOG,

READY MARCH 20.

A Complete Line.

40 Gas Ranges, listing from $16 to $68. Every one a Jewel.

47 Other Gas Cooking Appliances. . . .

GEORGE M. CLARK AND COMPANY,

72-74-76 LAKE STREET, CHICAGO.

Our New Works give us Unexcelled Facilities for Manufacturing and Shipping.

AMERICAN GAS COMPANY

Constructors of Coal Gas Apparatus.

KLONNE-BREDEL

Recuperative Furnaces, Washers, Condensers, Purifiers and Purifying Machines, Ammonia Plant, Coke Conveyers, Etc.

Complete Works Erected with Guaranteed Results.

EASTERN AGENTS FOR

FRED. BREDEL'S SYSTEM
COAL GAS PLANTS AND GAS APPARATUS.

P. H. & F. M. ROOTS CO.'S
Exhausters, Blowers, etc.

222 South Third Street, Philadelphia, Pa.

GEORGE G. RAMSDELL, General Manager. Correspondence Solicited

FRED. BREDEL, C.E.

Coal and Water Gas Plants,

OWN SYSTEM.

Recuperative Furnaces, Washers, Condensers, Purifiers, Purifying Machines.

Gas Enriching Plants to Enrich Coal Gas up to 24 Candle Power, and Making a White, Bright, Non-smoking Gas.

COMPLETE GAS WORKS, COKE CONVEYERS, ETC.

No. 118 Farwell Avenue, · · Milwaukee, Wis.

Eastern Agents: AMERICAN GAS CO., Construction Department, 222 So. 3d St., Phila., Pa.

ROOTS'

LATEST IMPROVED GAS EXHAUSTER

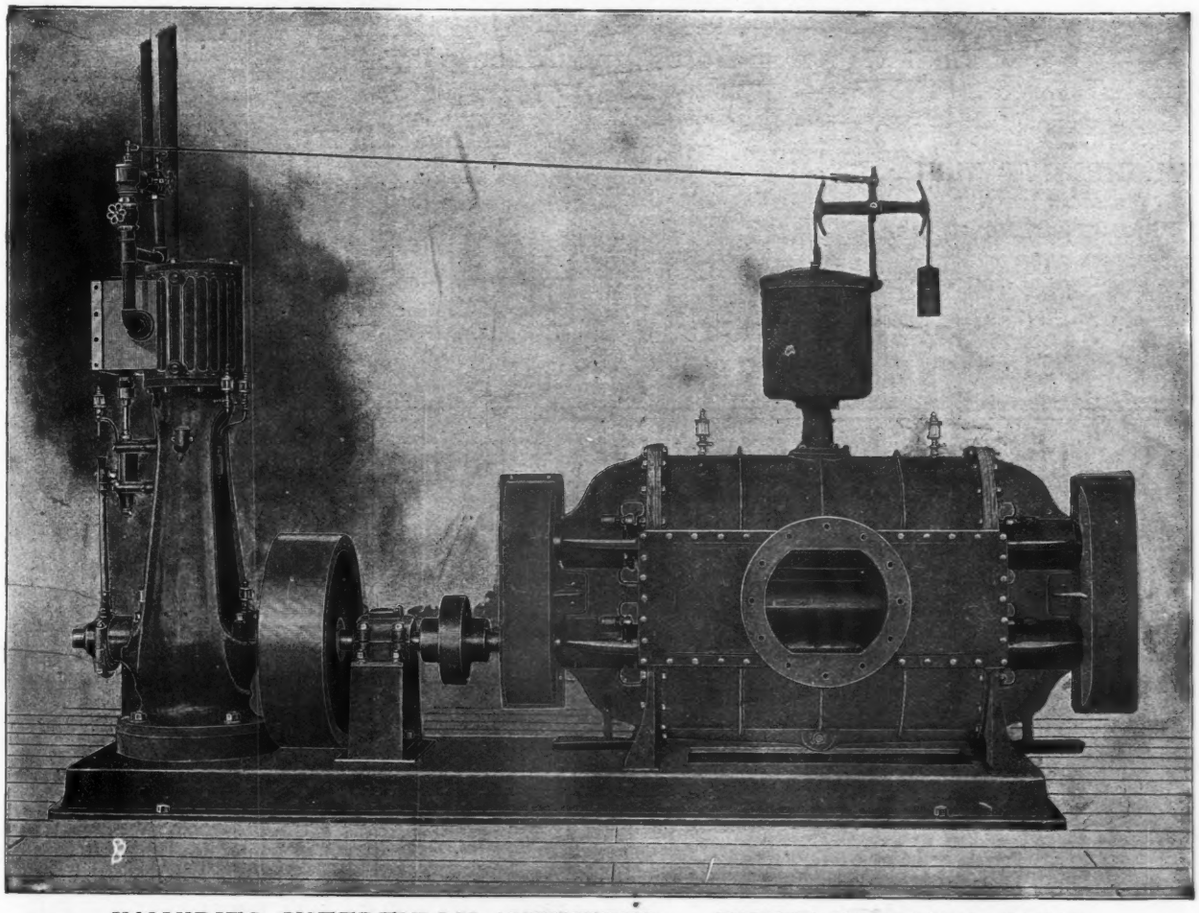
—AND—

NEW GAS GOVERNOR AND STEAM VALVE.

GUARANTEED TO REGULATE WITHIN ONE-TENTH OF AN INCH, WATER PRESSURE.

The Most Perfect Gas Governor on the Market.

MORE DIRECT IN ACTION. FEWER PARTS.
EASIER TO ADJUST THAN ANY OTHER GOVERNOR.



INQUIRIES CHEERFULLY ANSWERED. WRITE FOR CATALOGUE.

P. H. & F. M. ROOTS CO.,

Connersville, Ind. 109 Liberty St., New York.

Eastern Office:

American Gas Company,

222 South Third Street, Philadelphia, Pa.

Fort Wayne, Indiana.

THE WESTERN GAS CONSTRUCTION COMPANY.

Improved Lowe Water Gas Apparatus.
Coal Gas Apparatus and Machinery.
Gas Valves and Specials.
American Kilmarnock Gas Engine.

WM. HENRY WHITE,
EASTERN AGENT,
32 Pine Street, New York.

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

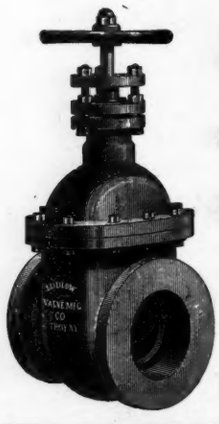
Also, Gate Fire Hydrants with and without Independent Nozzle Valve. All Work Guaranteed.

Works & Gen'l Office, Indian Orchard, Mass. Treasurer's Office, 72 Kilby & 112 Milk Sts., Boston, Mass.
Chicago Office, 24 West Lake St. New York Office, 28 Platt St.
St. Louis Office, L. M. Rumsey Mfg. Co., 810 North Second St.

MARQUAND & PARMLY,

160 Broadway, New York.

Members New York Stock Exchange.



THE

Ludlow Valve Mfg. Co.,

TROY, N. Y., U. S. A.

Double and Single Gate Valves, ¼" to 72"

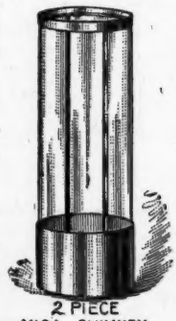
—FOR—

Gas, Water, Steam, Oil, Ammonia, Etc.

HOT GAS VALVES A SPECIALTY.

Send for Catalogue.

Our Mica Chimneys



2 PIECE MICA CHIMNEY.

Etched Chimneys to Order.

For Welsbach Lights ARE THE BEST IN THE WORLD.

Get Catalog and Discounts.

The MICA MFG. CO

Micasmiths,

88 Fulton Street, N. Y. City.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE

Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,

70 Rush St. Near Division Ave., Brooklyn, N. Y.

The Gas Engineer's Laboratory Handbook.

By JOHN HORNBY, F.I.C.

Price, $2.50.

A. M. CALLENDER & CO., 32 Pine Street, N.Y. City.

Practical Photometry.

A GUIDE TO THE STUDY OF THE MEASUREMENT OF LIGHT.

By William Joseph Dibdin.

Price, $3.00.

A. M. CALLENDER & CO., 32 PINE ST., N. Y. CITY

(Copyrighted, 1894, by the AMERICAN METER CO.

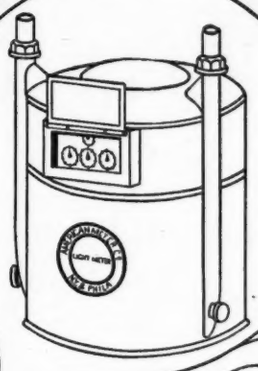
AMERICAN METER CO.

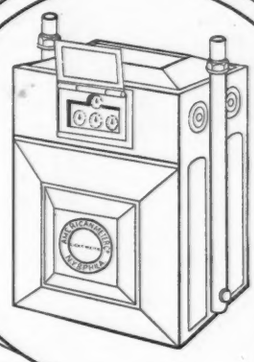
ESTABLISHED 1834. INCORPORATED 1868.

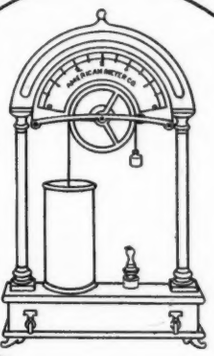
NEW YORK AND PHILADELPHIA,

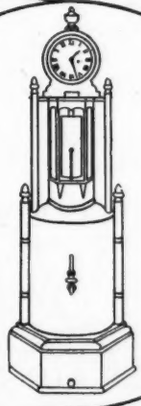
CHICAGO, ST. LOUIS,

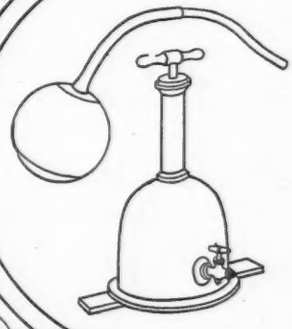
SAN FRANCISCO.

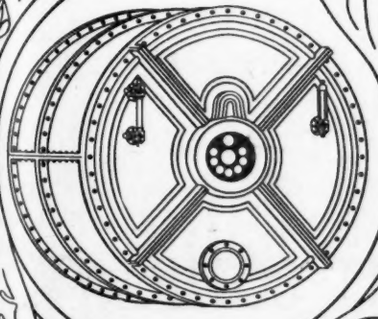


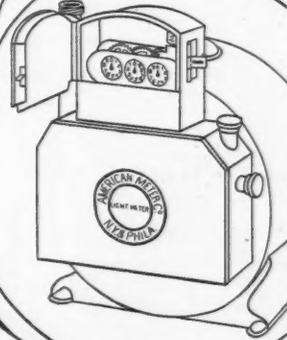












PUBLIC LIGHTING TABLE.

APRIL, 1898.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Fri.	1	2.20 AM	4.50 AM	6.10	4.55
Sat.	2	2.40	4.50	6.15	4.40
Sun.	3	3.10	4.40	6.15	4.40
Mon.	4	3.30	4.40	6.15	4.40
Tue.	5	No L.	No L.	6.15	4.40
Wed.	6	No L. FM	No L.	6.15	4.40
Thu.	7	No L.	No L.	6.15	4.40
Fri.	8	7.00 PM	10.10 PM	6.15	4.40
Sat.	9	7.00	11.20	6.25	4.30
Sun.	10	7.10	12.30 AM	6.25	4.30
Mon.	11	7.10	1.30	6.25	4.30
Tue.	12	7.10	2.20	6.25	4.30
Wed.	13	7.10 LQ	3.00	6.25	4.30
Thu.	14	7.10	3.30	6.25	4.30
Fri.	15	7.10	4.00	6.25	4.30
Sat.	16	7.10	4.20	6.30	4.20
Sun.	17	7.10	4.20	6.30	4.20
Mon.	18	7.10	4.20	6.30	4.20
Tue.	19	7.10	4.20	6.30	4.20
Wed.	20	7.10 NM	4.20	6.30	4.20
Thu.	21	7.10	4.20	6.30	4.20
Fri.	22	7.10	4.20	6.30	4.20
Sat.	23	7.10	4.20	6.40	4.10
Sun.	24	7.20	4.10	6.40	4.10
Mon.	25	10.30	4.10	6.40	4.10
Tue.	26	11.10	4.10	6.40	4.10
Wed.	27	11.50	4.10	6.40	4.10
Thu.	28	12.20 AM FQ	4.10	6.40	4.10
Fri.	29	12.40	4.10	6.40	4.10
Sat.	30	1.10	4.10	6.45	4.00

TOTAL HOURS LIGHTING DURING 1898.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	210.40	January	423.20
February	186.40	February	355.25
March	181.20	March	355.35
April	166.10	April	298.50
May	156.40	May	264.50
June	144.30	June	234.25
July	147.30	July	243.45
August	157.10	August	280.25
September	169.50	September	321.15
October	186.00	October	374.30
November	204.30	November	401.40
December	218.30	December	433.45
Total, yr.	2129.30	Total, yr.	3987.45

$500.00 Reward!

THE PUBLIC IS CAUTIONED that imitation and worthless incandescent burners and mantles are being sold by unscrupulous dealers on the representation that they are the genuine "Welsbach."

THE WELSBACH LIGHT COMPANY will pay $500.00 reward for the arrest and conviction of any person representing and selling incandescent burners or mantles as genuine "Welsbachs" that do not bear our trade-mark.

All genuine Welsbach lights have stamped on the brass work "Welsbach System, Patented," and all genuine Welsbach mantles are branded with our trade-mark, "J," and both burners and mantles are sold in boxes bearing our trade name, "Welsbach."

All other incandescent gas lamps and mantles are infringements of this Company's patents, notwithstanding representations to the contrary, and all manufacturers, sellers or USERS of infringing burners or mantles are liable to be and will be prosecuted

WELSBACH LIGHT COMPANY.

The United Gas Improvement Company,

Since originating and developing

The Standard Double Superheater, and

The Standard Junior,

LOWE WATER GAS APPARATUS,

Has installed, up to January 1, 1898,

242 Sets—Daily Capacity, 128,475,000 Cu. Ft.

Has under contract, since January 1, 1898,

8 Sets—Daily Capacity, 7,750,000 Cu. Ft.

And is now building in its OWN WORKS

apparatus of the SAME TYPE,

20 Sets—Daily Capacity, 36,000,000 Cu. Ft.

Total Built and under Construction,

270 Sets—Daily Capacity, 172,225,000 Cu. Ft.

The United Gas Improvement Company,

DREXEL BUILDING, PHILA., PA.

ALEX. C. HUMPHREYS, M. E.,
BANK OF COMMERCE BUILDING,
(31 NASSAU STREET,)
NEW YORK.

CABLE ADDRESS,
LONDON & NEW YORK,
"HUMGLAS."

ARTHUR G. GLASGOW, M.E.,
9 VICTORIA ST.,
LONDON, S. W.,
ENGLAND.

HUMPHREYS & GLASGOW,

CONTRACTING AND CONSULTING

GAS ENGINEERS.

WATER GAS PLANT A SPECIALTY.
GAS PROPERTIES EXAMINED AND VALUED.
ADVICE AS TO IMPROVEMENT OF GAS PROPERTIES AND MANAGEMENT.

RITER-CONLEY COMPANY,

GASHOLDERS, with or without Steel Tanks.

Purifiers, Condensers, Scrubbers, Oil Tanks, Smoke Stacks.

STEEL ROOFS and BUILDINGS.

PLATE AND STRUCTURAL WORK OF EVERY DESCRIPTION.

GENERAL OFFICE: Pittsburg, Pa. EASTERN OFFICE: 39-41 Cortlandt St., New York City.

NEW YORK, 33 NASSAU ST. PHILADELPHIA, 246 N. BROAD ST. CHICAGO, 54 LAKE ST.

WELSBACH STREET LIGHTING COMPANY OF AMERICA,

—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

STYLE No. 81.

STYLE No. 97.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

CORRESPONDENCE SOLICITED FROM GAS COMPANIES AND OTHERS INTERESTED IN MUNICIPAL LIGHTING.

NATIONAL GAS AND WATER CO.,

218 La Salle Street, Chicago.

Builder and Operator of Gas Works.

The Rew Soft Coal Carbureted Water Gas Apparatus.

TESTED BY THREE YEARS' PRACTICAL OPERATION, AND FULLY GUARANTEED.

Plans and Estimates Upon Application.

IRWIN REW, President and Treasurer. E. E. MORRELL, Engineer.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)

MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying material ever offered as a substitute for lime. We guarantee a large saving, both in cost of material and labor.

AUTOMATIC GOVERNOR. OVER FOUR HUNDRED NOW IN USE! NO WORKS COMPLETE WITHOUT IT! WILL PAY FOR ITSELF WITHIN A YEAR! ITS SERVICE SECURES PERFECT DISTRIBUTION! REDUCES LEAKAGE TO MINIMUM, and BENEFITS THE COMPANY and CONSUMER ALIKE! IT IS THE ONLY RECOGNIZED AUTOMATIC GOVERNOR IN THE WORLD!

STEAM JET EXHAUSTER. Designed particularly for small works. Combines Exhaust Tube, Steam Governor, Gas Compensator and Bye-Pass Valves in the most compact form possible. Occupies but little space; uses very little steam; saves formation of carbon in retorts; increases yield 10 to 15 per cent. No works too small to use them profitably.

Prices given on all our specialties, delivered at any point in the United States. Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 357 Canal St., New York.

Hughes' "Gas Works,"

Their Construction and Arrangement,

And the Manufacture and Distribution of Coal Gas.

Originally written by SAM'L HUGHES, C.E.

Rewritten and Much Enlarged by WM. RICHARDS, C.E

Eighth Edition, Revised, with Notices of Recent Improvements.

Price, $1.65.

A. M. CALLENDER & CO.,
32 Pine St., N. Y. City.

DOUGLAS' FERRIC OXIDE

For Gas Purification

Is a superior natural Hydrated Oxide of Iron. Will give a higher purification per bushel than any other material. We ship the pure Oxide of Iron, containing no sawdust, thus effecting a saving in freight, leaving the consumer to furnish the diluent at a nominal cost. It is now used by the largest gas companies in the West.

Full information, with references to many users, and prices delivered in any locality, furnished on application to

H.W. Douglas (Supt. Ann Arbor Gas Company) **Ann Arbor, Mich.**

ONEILL'S OXIDE,

(NATURAL BOG ORE)

For Gas Purification.

Has the Largest Annual Sale of Any Oxide in the World.

GAS PURIFICATION AND CHEMICAL CO., LTD.,
160, 161, 162 Palmerston Buildings,
Old Broad St., London, E.C., Eng.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER.

FOR UTILIZING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY

H. E. PARSON, Supt., 67 Bremen Street, Brooklyn, N. Y.

JAMES D PERKINS. **PERKINS & CO.,** F. SEAVERNS.

228 and 229 Produce Exchange, New York City.

TIDEWATER SALES AGENTS FOR THE FOLLOWING:

Ocean Mine Youghiogheny Gas Coal,

Clinch Valley, Thacker & Logan Gas Coals

Old Kentucky Shale and O. K. Boghead.

Shipments from New York, Philadelphia, Baltimore and Norfolk.

BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:

Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully prepared.
For Gas Making or
Heavy Steaming.

SCIENTIFIC BOOKS.

TECHNICAL GAS ANALYSIS. $3.

GAS CONSUMER'S HANDYBOOK, by Wm. Richards, C.E. 20 cents.

CHEMISTRY OF ILLUMINATING GAS. By Norton H. Humphrys. $2.40.

PRACTICAL TREATISE ON HEAT By Thomas Box. 2d edition. $5.

PRACTICAL PHOTOMETRY: A Guide to the Study of the Measurement of Light. By W. J. Dibdin. $3.

CHEMICAL TECHNOLOGY: Vol. I., *Fuel and Its Applications*, $5. Vol. II., *Lighting*, $4.

IRONWORK: Practical Designing of Structural Ironwork. By H. Adams. $3.50.

GAS WORKS: Their Arrangement, Construction, Plant and Machinery. $5.

PRACTICAL HANDBOOK ON GAS ENGINES, by G. Lieckfield. $1.

LIQUID FUEL FOR MECHANICAL AND INDUSTRIAL PURPOSES. By E. A. Brayley Hodgetts. $2.50.

COAL, SPONTANEOUS COMBUSTION OF. By Thomas Rowan, C.E. $2.

COAL: Its History and Use. By Prof. Thorpe. $3.50.

THE GAS WORKS OF LONDON. By Colburn. 60 cents.

HEAT A MODE OF MOTION. By John Tyndall. $2.50.

THEORY OF HEAT. By J. Clerk-Maxwell. $1.50.

THE MANAGEMENT OF SMALL GAS WORKS. By C. J. R. Humphreys. $1.

MANUAL FOR GAS ENGINEERING STUDENTS. By D. Lee. 40 cents.

GASFITTER'S GUIDE, by John Eldridge 40 cents.

AMMONIA AND AMMONIUM COMPOUNDS. By Dr. R. Arnold. $2

CONSTRUCTION OF GAS WORKS, by Walter Ralph Herring. $2.

DIGEST OF GAS CASES. $5.

PRACTICAL HINTS ON REGENERATOR FURNACES By M. Graham. $1.25.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR. By Geo. Lunge. New edition. $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS. By D. A. Graham. $3.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Prof. Victor Von Richter. $2.

ILLUMINATING AND HEATING GAS. By W. Burns. $1.50

HANDBOOK FOR MECHANICAL ENGINEERS. By H. Adams. $2.50.

TREATISE ON MASONRY CONSTRUCTION. Baker. $5

GAS ENGINEER'S LABORATORY HANDBOOK. By Jno. Hornby, F.I.C. $2.50.

GAS LIGHTING AND GAS FITTING. By W. P. Gerhard. 50 cents.

PRACTICAL PLUMBING. By P. J. Davies. $3.

GAS MANUFACTURE, THE CHEMISTRY OF, by W. J. A. Butterfield. $3.50,

AMERICAN PLUMBING. By Alfred Revill. $2.

CEMENT; A Manual of Lime and Cement, their Treatm and Use in Construction. By A. H. Heath. $2.50.

ELECTRICITY.

INDUSTRIAL PHOTOMETRY, with Special Application to Electric Lighting. By A. Palaz, Sc.D. $4.

ELEMENTS OF ELECTRIC LIGHTING, Including Electric Generation, Measurement, Storage and Distribution. By Philip Atkinson. $1.50.

ELECTRIC TRANSMISSION OF ENERGY. By G. Knapp. $3.50.

ELECTRICIAN'S POCKETBOOK. By Monroe and Jamieson. $2.50.

MAGNETISM AND ELECTRICITY. By J. Overend. 40 cts

DYNAMO BUILDING. By F. W. Walker. 50 cents.

DOMESTIC ELECTRICITY FOR AMATEURS. By E. Hospitalier. $2.50.

PRACTICAL MANAGEMENT OF DYNAMOS AND MOTORS. $1.

PRACTICAL GUIDE TO THE TESTING OF INSULATE WIRES AND CABLES. $1.

ELECTRIC LIGHTING, by Francis B. Crocker, E.M. $3.

ELECTRIC LIGHT FITTING. $2.

PRACTICAL ELECTRICITY. $2.50.

ELECTRICITY FOR ENGINEERS. $2.50.

ELECTRICITY, Its Theory, Sources and Applications. By John T. Sprague, M.I.E.E. $6.

The above will be forwarded upon receipt of price. If sent by mail or express, postage or express charges must be added to above prices. We take especial pains in securing and forwarding any other Works that may be desired, upon receipt of order. All remittances should be made by check, draft, or post office money order No books sent C.O.D.

A. M. CALLENDER & CO., 32 Pine Street, New York.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, - - Clarksburgh, Harrison Co., West Va.
WHARVES, - - - Locust Point, Baltimore, Md.
OFFICE, - 640 Equitable Building, Baltimore, Md.

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS, { BANGS & HORTON, 60 Congress St., Boston.

W. D. ALTHOUSE & CO.

Reading Terminal—Philadelphia.

"Shaner," Westmoreland, Pa.

HIGH GRADE GAS COAL
AND
KENTUCKY CANNELS.

KELLER ADJUSTABLE COKE CRUSHER.

Strong, Simple, Durable. Will Crush any Size Desired.

C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

GREENOUGH'S "DIGEST OF GAS CASES."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO., 32 Pine St., N. Y.

— THE —

PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened and Prepared for Gas Purposes.

Their property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad; and on the Youghiogheny River.

Principal Office:

Room 720, Reading Terminal Building, Phila., Pa.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

EDMUND H. McCULLOUGH, Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Pa.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.,
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE SUN OIL CO.,

Crude Oil, Gas Naphtha,
Refined Petroleum, Gas Oil.

Toledo, O., and Pittsburgh, Pa.

Standard Oil Company,

GAS NAPTHA DEPARTMENT.

GAS NAPTHA.

GAS OIL.

Correspondence Solicited.

26 Broadway, New York City.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY Prest. DAVID R. DALY V. Prest. & Treas.
H. D. ABERNETHY. Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

MANUFACTURERS OF

CLAY GAS RETORTS, FIRE CLAY TILES,
FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING GENERATOR GAS FURNACE

E. D. WHITE, President. A. H. GUTKES, Vice-President. H. A. PERKINS, Secretary.

Brooklyn Fire Brick Works,

MANUFACTURERS OF

CLAY RETORTS, FIRE BRICK,
Gas House and other Tile.

Office, 88 Van Dyke St., Brooklyn, N. Y.

Established 1854. Incorporated 1869.

LACLEDE
Fire Brick Manufg. Co.,

Manufacturers of GAS RETORTS . .
FIRE BRICK . . .
RETORT SETTINGS

Water Gas Cupola Linings, Fire Clay, Etc.

Exclusive Agents for

The Mitchell Half-Depth Regenerative Furnace.

This is the *original* coal-consuming Furnace for Retort Benches. Burns either Coal or Coke. Full and Half-Depth Regenerative Furnaces for Benches of 6's, 7's, 8's or 9's erected complete.

Proprietors of the Coze System of Inclined Retorts.

Office: 901 Pine St., **St. Louis, Mo.**

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

Office, 119 E. 23d St., New York.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

Adam Weber,

Proprietor,

Manhattan Fire Brick and Enameled Clay Retort Works.

Works, Weber, N. J.

Office, 633 East 15th St., New York.

Modern Recuperative Furnaces

And Standard Fire Brick and Gas Retorts.

Works,
LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Hamilton Building, Fifth Avenue,
PITTSBURGH, PA. P. O. Box 373

Successor to WILLIAM GARDNER & SON

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

PRICE LIST.

In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD & CO.,

N. 3d & Prospect Avs., Mt. Vernon, N.Y.

Western Agent, H. T. GEROULD, Centralia, Ills.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,
417 Pine Street, St. Louis, Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We construct

Half and Full Depth Benches of Our Own Design,

Containing 6, 8 or 9 Retorts.

We have Greatly Improved our Recuperators. Coal or Coke can be used as Fuel in Furnaces.

THEO. J. SMITH, Prest. J. A. TAYLOR, Sec'y
A. LAMBLA, Vice-Prest. and Supt.

BALTIMORE

RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT BALTIMORE MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 102 MILK ST., BOSTON, MASS

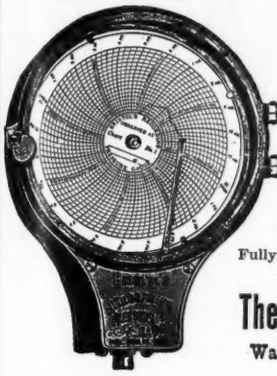
Sole Agents for New England States.

PRACTICAL PHOTOMETRY.

A Guide to the Study of the Measurement of Light.

By WILLIAM JOSEPH DIBDIN.

With Numerous Illustrations. Price, $3.00 A. M. CALLENDER & CO., 32 Pine Street, N. Y. City



BRISTOL'S RECORDING

PRESSURE GAUGE.

For continuous records of **Street Gas Pressure**

Simple in Construction, Accurate in Operation Low in Price.

Fully Guaranteed. Send for Circulars.

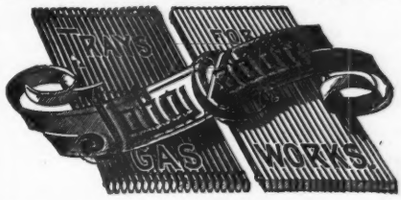
The Bristol Co.,

Waterbury, Conn.

Special Trays for Iron Sponge or Oxide of Iron,

CHURCH'S TRAYS a Specialty.

Reversible, Strongest, Most Durable, Most Easily Repaired.



553-557 West Thirty-third Street, New York.

We also make the Cheapest and Strongest REVERSIBLE BOLTED TRAYS IN THE MARKET.

Send for Circulars.

F. BEHREND,

SOLE IMPORTER OF THE CELEBRATED

German (Stettin-Didier) Clay Gas Retorts,

BLOCKS, TILES, FIREBRICKS, FIRE CEMENT,

Stettin "Anchor" & "Eagle" Brand Portland Cement

10 & 12 Old Slip, New York.

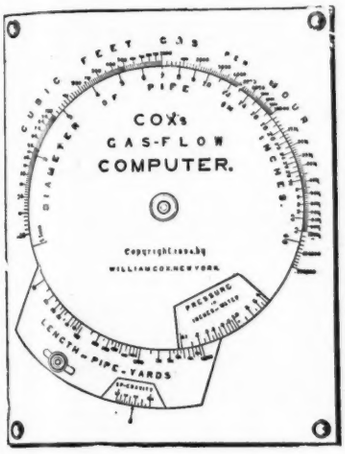
IRON MASS

For Gas Purification.

Acts immediately, and more efficiently than any other purifying agent now in use.

GREENPOINT CHEMICAL WORKS,

Greenpoint Ave. and Newtown Creek, Brooklyn, N. Y.



Do you wish to Know

what size of Pipe to use to convey any quantity of Gas, any distance, with any loss of pressure, and any initial or final pressure? Then use

COX'S GAS FLOW COMPUTER,

as it gives this information accurately at sight, without mental effort. No calculations needed. Saves time, money and mistakes.

Price, 12 x 14 inches, on wooden board, $5.00.

For sale by

A. M. CALLENDER & CO., 32 Pine St., N. Y. City.

Coal Tar Genealogical Tree

MR. T. VINER CLARKE, of London, Eng.,

Having compiled a novel Chart or Map illustrating the various

CHEMICAL PRODUCTS DERIVED FROM COAL AND COAL TAR,

in the form of a Genealogical Tree, including all the products discovered to date (the total number amounting to near 700), offers for sale a limited number of copies in Colors, mounted on Linen, with Rollers. Price, $3.50. Orders may be sent to

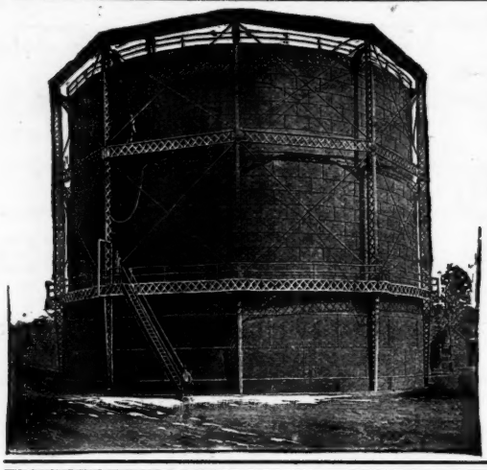
A. M. CALLENDER & CO., - - No. 32 Pine Street, New York.

THE MANAGEMENT OF SMALL GAS WORKS.

By C. J. R. HUMPHREYS.

Price $1.

A. M. CALLENDER & CO., No. 32 Pine Street New York



DAVIS & FARNUM MFG. CO.,

WALTHAM, MASS.

Principal Office & Works, Waltham, Mass. Boston Office, Rm 18, Vulcan Bldg., 8 Oliver St.

Single, Double and Triple-Lift Gasholders of any Capacity. Tubular, Pipe and Sinuous Friction Condensers of all Sizes.

Steel Tanks for Gasholders, Iron Roof Frames and Floors, Purifying Boxes, Center Seal or Valve Connections, Bench Work, Reversible Lime Trays.

Self-Sealing and Pressed Steel Mouthpiece Lids.

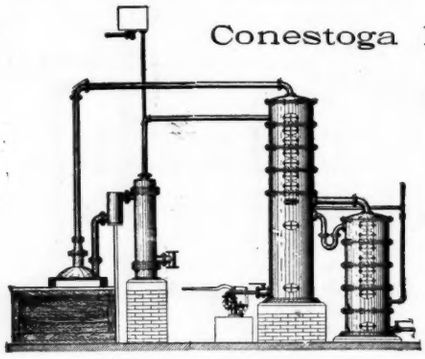
Coke Borrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Works.

Also, Gas and Water Pipe, Flanged Pipe, Sugar House Work, and Special Castings of all Descriptions.

GAS ENGINEERING COMPANY.

INCORPORATED,

Conestoga Building, PITTSBURGH, PA.



AMMONIA MACHINE.

MANUFACTURERS OF

Gas Works Machinery of all kinds,

PATENTEES AND OWNERS OF

PITTSBURGH WASHER-SCRUBBER,

SOLE AGENTS FOR

FELDMANN AMMONIA MACHINE,

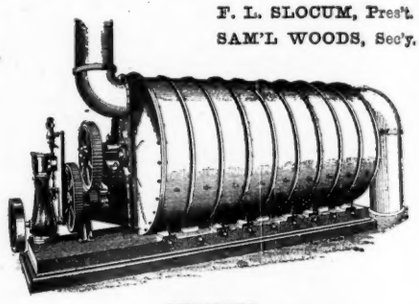
For producing Sulphate, Aqua, Chloride and Concentrated Liquors.

The Erection of Bi-Product Coke Ovens a Specialty.

Faux System of Recuperative Benches.

NEW SYSTEM HYDRAULICS.

F. L. SLOCUM, Pres't.
SAM'L WOODS, Sec'y.



SCRUBBER.

Kerr Murray Manufacturing Company,

Steel Gasholder Tanks,

SINGLE, DOUBLE AND TRIPLE-LIFT GASHOLDERS,

HORIZONTAL AND VERTICAL STORAGE OIL TANKS

Iron Work for Coal Gas Benches, Self-Sealing Mouthpieces, Exhausters, Condensers, Scrubbers, Purifiers, Wooden Trays, Floor Carriages, Center Seal and Valve System Connections, Cast and Wrought Iron Fittings, and Connections 3 to 36 Inches Diameter.

VALVES, Double Gate, Hub and Flange, Outside Screw and Quick Opening, 3 to 36 In. Diam.

COAL AND COKE WAGONS, RETORT HOUSE TOOLS, STREET MAIN SPECIALS AND DRIPS.

Address,

KERR MURRAY MANUFACTURING CO.

Fort Wayne, Indiana.

BARTLETT, HAYWARD & CO.

BALTIMORE, MD.

Triple, Double and Single-Lift Gasholders.

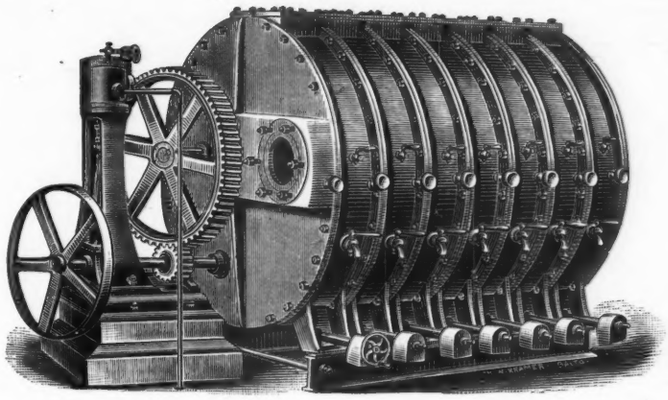
Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS

PURIFIERS.



CONDENSERS.

Scrubbers.

Bench Castings.

OIL STORAGE TANKS.

Boilers.

PATENT STANDARD WASHER-SCRUBBER.

The best apparatus for the extraction of all Ammonia and a large proportion of Carbonic Acid and Sulphureted Hydrogen. The Scrubber has been materially improved and is provided with patented Wooden Segmental Grids, instead of Metallic Discs, thus reducing the weight on shaft and power for operating same.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSIBLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

MILL'S REVERSIBLE LIME TRAYS.

Gas Works Designed and Constructed.

PRACTICAL HANDBOOK ON

GAS ENGINES

With Instructions for Care and Working of the Same.

By G. LIECKFELD, C.E.

Translated with Permission of the author by GEO. M. RICHMOND, M.E.

Price, $1.00.

A. M. CALLENDER & CO., 32 Pine Street, New York.

R. D. WOOD & CO.,

ENGINEERS, IRON FOUNDERS, MACHINISTS.

400 Chestnut Street, Philadelphia, Pa.

MANUFACTURERS OF

CAST IRON PIPE.

BUILDERS OF

Gas Holders,

Single, Double and Triple Lifts, with or without Wrought Iron or Steel Tanks.

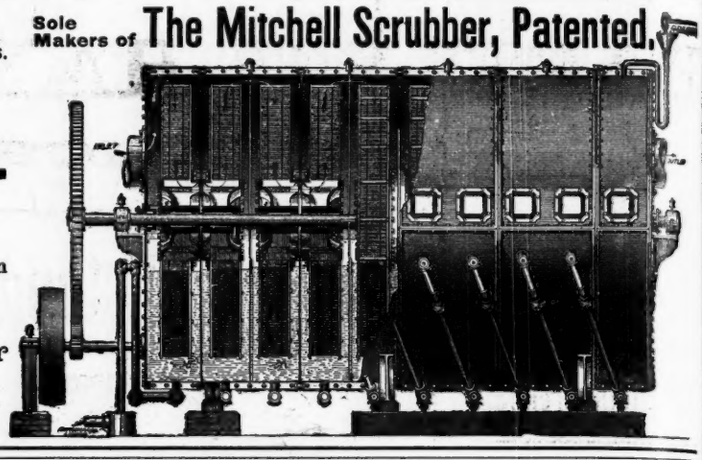
PURIFIERS, CONDENSERS, SCRUBBERS.

The Hopper Automatic Gas Governor

Send for Pamphlet.

Dunham Patent Specials.

Sole Makers of **The Mitchell Scrubber, Patented.**



ISBELL-PORTER CO.,

ENGINEERS AND CONTRACTORS FOR THE

Construction and Extension of Gas Works.

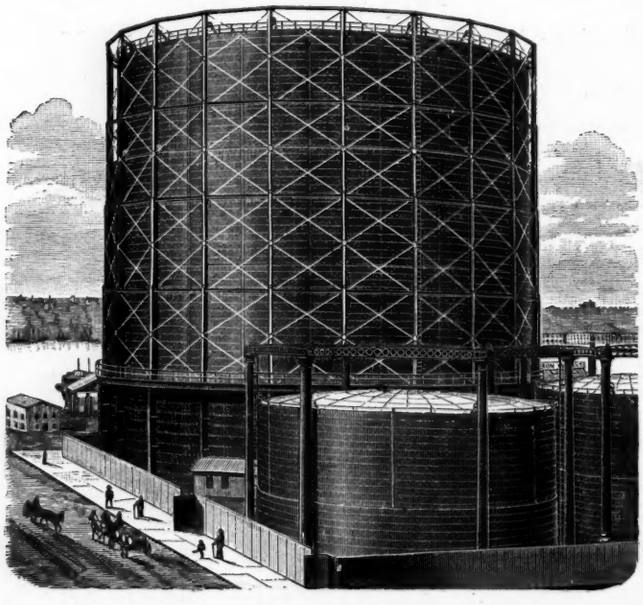
FOUNDERS AND MACHINISTS.

MANUFACTURERS OF

All Ironwork and Machinery Required in a Gas Plant.

Estimates, Drawings and Specifications furnished for the Alteration, Improvement, or Extension of Existing Works or the Construction of New Works.

245 Broadway, New York City. OFFICES **Bridge & Ogden Sts., Newark, N. J.**



The Continental Iron Works,

THOMAS F. ROWLAND, President.
WARREN E. HILL and CHAS. H. CORBETT, Vice-Presidents.
THOMAS F. ROWLAND, JR., Secretary & Treasurer.

West and Calyer Sts. (Near 10th & 23d St. Ferries)
NEW YORK, Borough of Brooklyn.

BUILDERS OF

Gas Holders.

Single and Multiple Section Gas Holders a Specialty.

STEEL GAS HOLDER TANKS.

BENCH CASTINGS, RETORT LIDS.

Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, Etc.

Self-Sealing Retort Mouthpieces & Lids

For Round, Oval, or "D" Retorts.

ILLUMINATING GAS! FUEL GAS!

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Son's Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Plans and Estimates Furnished.

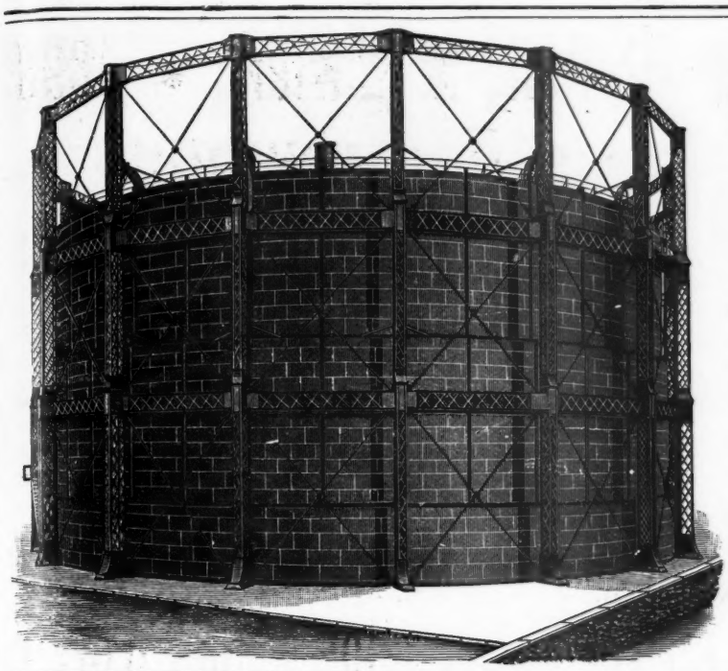
BURDETT LOOMIS, - - Hartford, Conn.

To Gas Companies.

We make to order **CAP BURNERS** to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,
948 N. 8th St., Phila., Pa.



H. RANSHAW, Prest. & Mangr. T. H. BIRCH, Asst. Mangr
WILLIAM STACEY, Vice-Prest. R. J. TARVIN, Sec. & Treas.

THE STACEY MANUFACTURING CO

Established 1851.

Single, Double and Triple-Lift

GASHOLDERS,

Of any Capacity, with or without Wrought Iron or Steel Tanks.

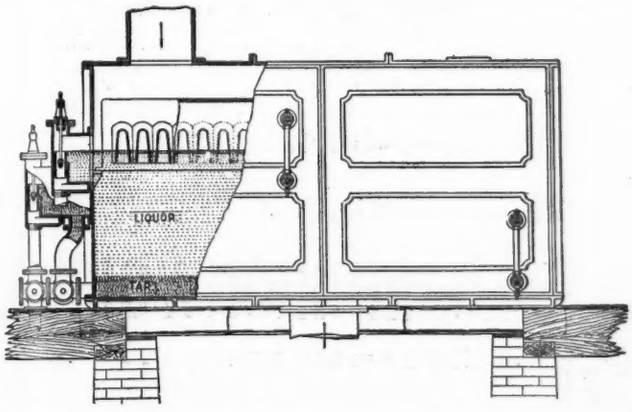
Hydraulic Mains, Condensers, Scrubbers, Purifiers, Valves, etc.

Coal Gas Benches, Roof Frames,

OIL STORAGE TANKS.

Pressed Steel Mouthpiece Lids, Self-Sealing Mouthpiece Lids.

Cincinnati, Ohio.



GEO. SHEPARD PAGE'S SONS,

SOLE AGENTS FOR THE

Walker Tar and Carbonic Acid Extractor.

During the Winter months over 12,000,000 feet of gas daily is being relieved of *all* Tar and a large percentage of Carbonic Acid by the Walker Extractor. They should be placed before all Scrubbers. The Tar and Liquor Overflow Valves work automatically. Write for Circulars.

69 Wall Street, - - New York City.

GEORGE R. ROWLAND.

Formerly with the Continental Iron Works.

Draughtsman and Constructing Engineer.

Drawings, Specifications and Estimates furnished for the construction of new works or alteration of old works. Special attention given to Patent Office drawings.

Office, No. 245 Broadway, N. Y. City.

W. H. PEARSON, Prest. J. W. WESTCOTT, Gen'l Mangr. and Treas. L. L. MERRIFIELD, Chief Engr.

THE ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, Limited

269 Front Street, East, Toronto, Canada.

ENGINEERS AND BUILDERS OF THE **IMPROVED LOWE WATER GAS APPARATUS.**

Designed to give the Greatest Efficiency when using any kind of Oil, Anthracite Coal, Gas House or Oven Coke.

New Gas Works Built, Present Gas Plants, either Coal or Water, Remodeled

Catalogues, Plans and Estimates Furnished upon Application.

WM. HENRY WHITE,

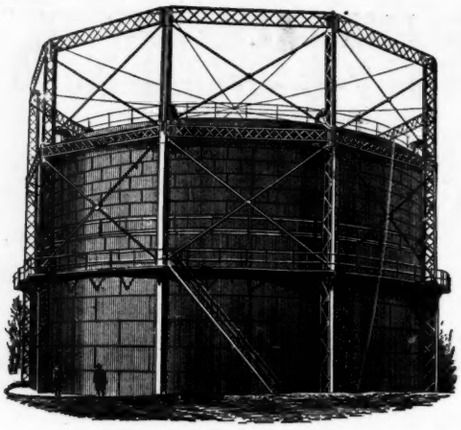
No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited. Plans and Estimates Furnished.



1842 * Deily & Fowler, * 1898

LAUREL IRON WORKS.

Office, No. 39 Laurel Street, Philadelphia, Pa

BUILDERS OF

Gasholders

Single or Telescopic. With or Without Iron or Steel Tanks.

OIL TANKS, WATER TANKS, AND GENERAL WROUGHT IRON WORK.

JAMES R. FLOYD'S SONS,

Successors to HERRING & FLOYD,

Oregon Iron Works,

West 20th and 21st Streets, Between 10th & 11th Avenues, New York City.

Engineers and Contractors for the Construction of Gas Works.

MANUFACTURERS OF ALL KINDS OF CASTINGS AND GENERAL IRONWORK FOR GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings, Condensers, Tower Scrubbers, Mechanical Scrubbers, Purifiers, Malleable Iron Retort Lids, Self-Sealing Retort Lids, Hydraulic Hoist Purifier Carriage, Crosses, Tees, Bends, Angles, Reducers, S-Bends, Sectional Sleeves, Plugs, Caps, Street Drips, etc., always on hand.

WOOD'S GAS SCRUBBING AND ENRICHING APPARATUS.

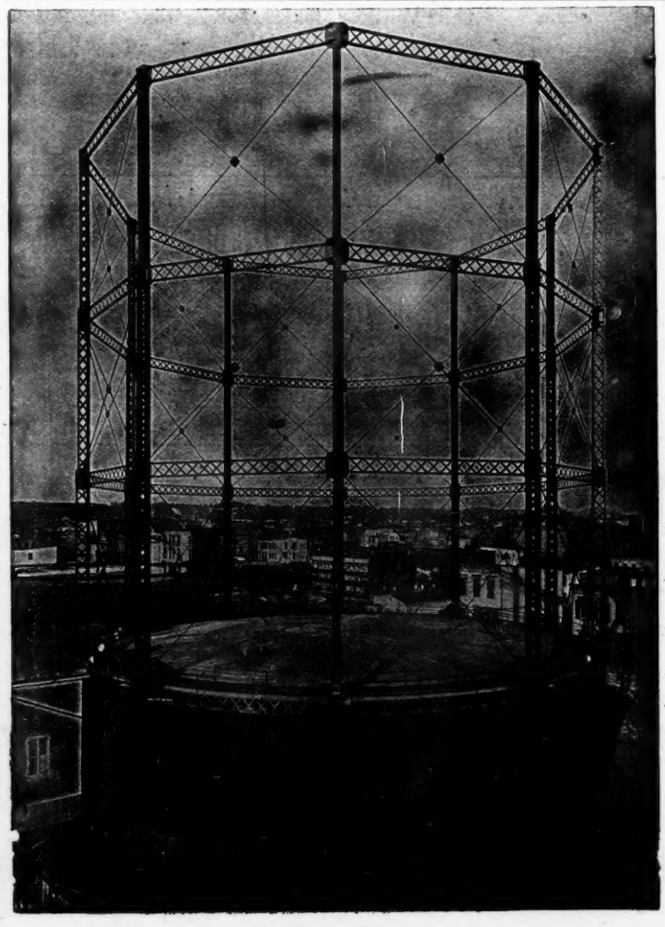
In use at Syracuse, Auburn, Watertown, Cortland and Geneva, N.Y.; Elizabeth, N. J.; Boston, Mass.; Jamaica Plain, Mass.; Providence, R. I.; Northern Liberties Gas Co., Phila

Sole Manufacturers of the OGDEN QUICK-MOVING VALVE.

HEARNE CENTER SEAL, Operating One, Two, Three or Four Boxes.

Stroh & Osius Concentrator for Ammoniacal Liquor, used by 50 Gas Companies and Cokeries during the past 4 years.

The order for this Triple-Lift Holder and Steel Tank was received by the Logan Iron Works from the Union Gas Light Company, of East New York. The contract was completed and the Holder was in actual use in 90 days from receipt of order. Capacity of Holder, 500,000 Cu. Ft.



LOGAN IRON WORKS,

Brooklyn, N. Y.

MANUFACTURERS OF

Single or Multiple-Lift

GASHOLDERS,

Complete with Steel Tanks.

BENCHES, SCRUBBERS,

CONDENSERS,

PURIFIERS, IRON ROOFS,

Self-Sealing Retort Lids,

AND ALL PARTS OF

GAS WORKS APPARATUS

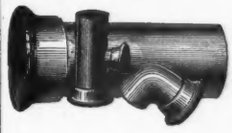
Contractors for Complete Works.

ALSO, SOLE MANUFACTURERS OF

C. W. BLODGET'S

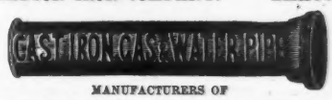
HOT GAS SCRUBBER.

THE OHIO PIPE COMPANY,
MANUFACTURERS OF
Cast Iron Gas & Water Pipe,
BRANCH AND SPECIAL CASTINGS.
Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.
GENERAL FOUNDERS AND MACHINISTS
Columbus, Ohio.

WARREN FOUNDRY AND MACHINE CO.,
Established 1856. Works at Phillipsburgh, N. J.
New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,
FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF
Flange Pipe for Sugar House and Mine Work. Branches. Bends, Retorts, etc., etc

DAVID LEAVITT HOUGH,
26 CORTLANDT ST., N.Y. CITY.
Consulting Engineer.
Investigations and Appraisals.
Designs and Estimates.
Contractor.
Machinery and Structures.
Gas and Water Pipe.
Special Agent for Selling & Purchasing.

"GLOBE" SPECIALS VALVES, ETC. "GLAMORGAN" FIRE HYDRANT
M. J. DRUMMOND & CO.
MANUFACTURERS OF
CAST IRON
FLANGE
GAS AND WATER PIPE
GENERAL SALES OFFICE, 192 BROADWAY, NEW YORK.
Western Office: Monadnock Block, Chicago, Ills.

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa.
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa
EMAUS PIPE FOUNDRY.
DONALDSON IRON COMPANY. EMAUS, PA


MANUFACTURERS OF
CAST IRON PIPE AND SPECIAL CASTINGS
FOR WATER AND GAS.
Also, FLANGE PIPE, LAMP POSTS, Etc.

Practical Hints
ON THE CONSTRUCTION AND WORKING OF
Regenerator Furnaces,
By MAURICE GRAHAM, C.E.
Price $1.25.
A. M. CALLENDER & CO., 32 Pine Street, N.Y.

CHARLES MILLAR & SON, Selling Agents, Utica, N. Y.
Flanged Pipe and Fittings, Hydrants, Gates, Pig Lead, Jute, etc.
UTICA PIPE FOUNDRY CO.
Manufacturers of Lead Pipe, Solder, etc., and Jobbers of Plumbers' and Tinners' Goods.
CAST IRON PIPE and SPECIALS FOR WATER AND GAS.
Wholesale Eastern Agents AKRON VITRIFIED SEWER PIPE.

Established 1854.
D. McDONALD & CO.,
MANUFACTURERS OF
WET AND DRY METERS, STATION METERS AND METER PROVERS.
—ALSO MAKERS OF
THE GLOVER PREPAYMENT METER.

The amount of gas delivered for the coin can be instantly and positively changed without removing the meter or replacing any parts.

The gas registered agrees absolutely with the amount purchased by the coin.

WE HAVE MADE AND SOLD IN THE UNITED STATES
OVER 20,000 OF THESE METERS,
ALL OF WHICH ARE GIVING PERFECT SATISFACTION.
Correspondence Solicited.

511 West Twenty-first Street, NEW YORK. | 51, 53 & 55 Lancaster Street, ALBANY, N. Y. | 34 & 36 West Monroe Street, CHICAGO.

Established 1849. With the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS METER CO.,

63 Beverly Street, Boston, Mass.

MANUFACTURERS OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Apparatus for the Chemical Testing of Gas and Gas Liquor.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 107 West Monroe St.**
NEW YORK, 838 Broadway. **SAN FRANCISCO, 221 Front St.**
BOSTON, 92 Water Street, Rooms 21 and 22.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Perfect" Gas Stoves

METRIC METAL COMPANY,

MAKERS OF

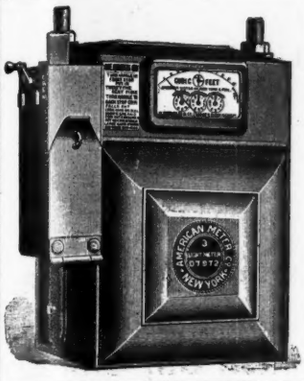
GAS METERS for NATURAL and ARTIFICIAL GAS.

Special Attention given to Repairing METERS of all Makes.

FACTORY AT ERIE, PA.

Use Keystone Meters.

Royersford, Pa.

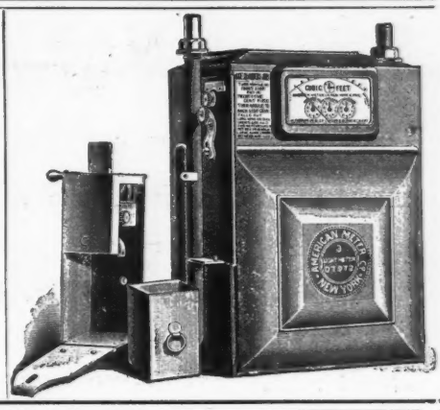


American Meter Co.

NEW YORK, PHILADELPHIA,
SAN FRANCISCO.

Prepayment Meters.

Their construction is such that they may be readily readjusted when the scale of gas rates is changed.



HELME & McILHENNY,

Established 1848. **1339 to 1349 Cherry Street, Philadelphia, Pa.**

MANUFACTURERS OF

Wet and Dry Gas Meters, Station Meters, Provers, Gauges, Etc.

METERS REPAIRED

PREPAYMENT GAS METERS.

Our Own Patents. Strong. Simple. PROMPT ATTENTION. CORRESPONDENCE SOLICITED.

FIELD'S ANALYSIS

For the Year 1896.

An Analysis of the Accounts of the Principal Gas Undertakings in England, Scotland, and Ireland. Being the Twenty-eighth Year of Publication. Compiled and Arranged by

JOHN W. FIELD, Sec. & Gen. Mangr. of The Gas Lt. & Coke Co., London.

Price, $5. For Sale by

A. M. CALLENDER & CO., - No. 32 Pine Street, N. Y. City.

This is the best time to look after your repairing.

Seventy per cent. of old meters run slow. You are losing money on them. Let us put them in shape for you, a few at a time, until your entire meter equipment is made as good as new. It is better to attend to this matter now, before the Gas Stove season is at its height. Probably we can do such work in our factory better and cheaper than you can do it at home, and just now we can do it promptly.

The BUHL METERS are as good Meters as you can get.

DETROIT METER COMPANY, - - Detroit, Mich.

The Advertisement of the

OTTO GAS ENGINE WORKS,

33d and Walnut Streets, Philadelphia,

New York, 39 Cortlandt St, Boston, 19 Pearl St., Chicago, 245 Lake St.,

Occupies this space every alternate week.

JOHN J. GRIFFIN & CO.,

1513-1515-1517-1519-1521 Race Street, Philadelphia.

52 Dey Street, New York. WM. S. GRIBBEL, Manager.

75 N. Clinton St., Chicago. FREDERICK WAUGH, Manager.

MANUFACTURERS OF

STATION METERS, CONSUMERS' METERS,

Provers, Registers, Gauges, Experimental Apparatus, Etc.

Prompt Attention Given to All Repairing.

OUR SPECIAL NATURAL GAS METER

Is the Best ever offered. Over 30,000 now in use.

We manufacture in the United States, under the SAWER & PURVES PATENTS, the

Positive Prepayment Meter.

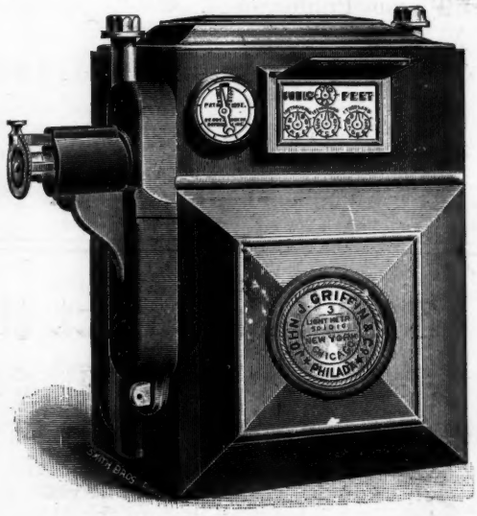
. . SIMPLE . .

. DURABLE .

. ACCURATE .

. RELIABLE .

All Parts Interchangeable



This Meter is an unqualified success in Great Britain. Its simplicity of construction, and the positive character of the service performed by it, have given it pre-eminence.

Needs Only the Care Given an Ordinary Meter.

Saves MONEY, TIME and CONSUMERS.

Dispenses with "DEPOSITS" and Increases OUTPUT.